Dentist, Doctor, Dean: Professor Sir Charles Hercus and his record of fostering research at the Otago Medical School, 1921-1958.

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Abstract

This thesis investigates the development of medical research at the University of Otago Medical School in Dunedin, New Zealand under Sir Charles Hercus, Dean from 1937-1958. It will also explore his interest and participation in research from his student days and the years before becoming Dean, as well as the influence of the First World War on his career.

The study draws upon unpublished material in New Zealand archives and a collection of student projects investigating public health issues. Hercus, as Professor of Public Health and Bacteriology incorporated these projects into the curriculum in the early 1920s. The thesis uses many original papers published in scientific and medical journals by Hercus and his colleagues at the School. Building on a base of archival material including contemporary newspaper accounts, which have lately become available on the Papers Past website, this thesis draws together the individual disease studies undertaken by other thesis writers to give an account of Hercus's achievements in fostering medical research.

A key finding of this thesis is that Hercus was instrumental in building up the research capability of the School. He accomplished this through his own investigations and by helping to establish the New Zealand Medical Research Council. The thesis illustrates the multitude of studies that Hercus undertook personally or facilitated others to pursue, beyond the elimination of endemic goitre, for which he perhaps is best known.

Another outcome of this study is an understanding of the difficult path that scientists faced in the early years of the twentieth century in New Zealand if they

wished to carry out research. This thesis follows the origins of the Department of Scientific Research in the 1920s and the frequent collaboration Hercus made with scientists outside of the School. It will also demonstrate Hercus's compassion and foresight in employing several Jewish refugee doctors as researchers at the School, who brought expertise into the research programmes.

The era was one of great interest in improving the health and wellbeing of a generation affected by wars and deprivation caused by them. A key finding of this thesis is that researchers at the School took steps to mitigate these through making New Zealand more self-sufficient in foodstuffs and to improve the national diet. As well, Hercus lobbied for the establishment of a School of Physical Education within the university to improve the physical fitness of the population.

Abbreviations

AJHR	Appendices to the Journals of the House of Representatives
ANZAAS	Australian and New Zealand Association for the Advancement of Science
BDS	Bachelor of Dental Surgery
BECCS	British Empire Cancer Campaign Society
CBHS	Christchurch Boys' High School
DADMS	Deputy Assistant Director of Medical Services
DPH	Diploma of Public Health
DSIR	Department of Scientific and Industrial Research
NZBECCS	New Zealand Branch of the Empire Cancer Campaign Society
NZBMA	New Zealand Branch of the British Medical Association
BMJ	British Medical Journal
JAMA	Journal of the American Medical Association
MD	Doctor of Medicine
MRC	Medical Research Council
NZMJ	New Zealand Medical Journal
NZDJ	New Zealand Dental Journal
NZPD	New Zealand Parliamentary Debates
NZDF	New Zealand Defence Force
MRC	New Zealand Medical Research Council
OUMC	Otago University Medical Company
WHO	World Health Organisation

Introduction

This thesis investigates the role of Sir Charles Hercus, D.S.O., O.B.E., M.D., B.D.S., D.P.H., the third Dean of the University of Otago Medical School, in fostering research at the School over the first half of the twentieth century. Hercus studied dentistry before graduating in medicine at the School in 1914. He served with New Zealand and Australian armies in the First World War before returning and starting a career in public health and preventive medicine, becoming Dean of the School in 1937.

Born in 1888, Hercus grew up in a country with a temperate climate and the ability to produce healthy food for its increasing population, but all was not well. The state of the population's teeth was very poor, so much so that it was rare for dentists to see a perfect set, endemic goitre was rife and there was rising incidence of hydatid disease in humans and a financial loss due to infected meat. Why these diseases should afflict a country settled so recently and from carefully selected immigrants needed investigation.

In 1883, Dr Alfred Newman and F.W. Frankland addressed the Wellington Philosophical Society praising the 'easiness of struggle for existence' presented by the 'sparse population of these lands, with their fertile soils and immense mineral wealth,' and giving the reasons why New Zealand possessed 'the lowest death-rate of any country of the world.'[1] The only indigenous diseases were the bite of the katipo spider and rare deaths from eating the occasional poisonous plant. What had happened to the state of health of New Zealanders in the nearly 40 years following this address was to

[1] Alfred K. Newman and F.W. Frankland, Is New Zealand a healthy country? – An enquiry with statistics," *Transactions and Proceedings of the New Zealand Institute,* 15 (1882): 493-510.

inspire Hercus to take up medical research. Not only were infectious diseases yet to be conquered, but there were diseases emerging that were caused by factors not recognised in the late nineteenth century when Newman and Frankland gave their talk.

Hercus was active in research at a time when there was a growing interest in scientific discoveries but it was still a period before medical research became specialised and one man could be active in several different fields. His association with medicine spans a period of rapid development of science, technology and medicine, spurred on by the discoveries of Koch and Pasteur, an era characterised by the growth of laboratory research that revealed a large number of new biological substances, such as hormones, vitamins and insulin. Scientists used animals to produce these compounds and act as experimental models to understand how they created these biological substances and to follow their action in the body. Kirk and Worboys note that the standardisation of these compounds required an 'analogous yet contextually different' method from that of vaccines.[2]

These 'new biological substances' included thyroid extract (derived from sheep) used to treat patients with hypothyroidism, a condition common in New Zealand and the subject of much of Hercus's research. Such compounds were much heralded on their discovery and could be taken up by patent medicine manufacturers and misused.

[2] Robert G.W. Kirk and Michael Worboys, "Medicine and species: one medicine, one history," in *The Oxford Handbook of the History of Medicine*, ed. Mark Jackson (Oxford, Oxford University Press, 2011): 569.

Thyroid extract is a case in point as it became notorious as an anti-obesity drug and as Bynum said 'became a kind of amphetamine for an earlier generation.'[3]

The urge to increase scientific research was also spurred on by the First World War that exposed weaknesses in British science and scientific research, as well as the poor state of physical fitness of young men supposedly in the prime of their lives enlisting for military service. The situation was not unique to this country, however and the British National Efficiency movement found fertile ground with Hercus and other medical men.[4] Hercus spent nearly five years on active war service abroad, returning to New Zealand in 1919 with extensive medical experience and highly decorated for his services.

Hercus returned to an atmosphere of increased interest in the concept of public health and preventive medicine. Sir George Newman, Britain's Director-General of Health as originator and promoter of much of Britain's policy on public health had great influence on New Zealand's health policies and was a model for Hercus's preventive medicine efforts.[5] Newman published his *Memorandum* on preventive medicine in 1919,

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[3] W.F. Bynum, ""C'est un malade": animal models and concepts of human diseases," *Journal of the History of Medicine and Allied Sciences* 45 (1990): 411.

[4] Warwick Brunton, *The medicine of the future: a history of the Department of Preventive and Social Medicine, University of Otago 1886-2011* (Dunedin, Department of Preventive and Social Medicine, 2011), 67. The National Efficiency Movement was set up in Britain at the time of the South African War, which exposed the poor physique of the troops. The movement aimed at producing a fit population, decreasing infant mortality, slowing a falling birth rate and reform of the Poor Law.

[5] D.W. Carmalt Jones, *Annals of the University of Otago Medical School* 1875-1939 (Wellington: A.H. & A.W. Reed, 1945), 189. Hercus's war experiences ultimately helped him gain his

sometime before October when a review appeared in *The British Medical Journal*.[6] As Hercus had access to the journal while serving in Palestine, it is possible that he was aware of the on-going debate on how to improve public health.[7] Hercus may have got his copy of Newman's report while he was on leave from Egypt at Edinburgh between August and late October 1919, although Brunton suggests that he owned a second-hand copy obtained later than this.[8]

Newman's *Memorandum*, reprinted in 1926 due to popular demand, emphasised the need to 'develop and fortify the physique of the individual and thus increase the capacity and powers of resistance of the individual and the community.'[9] Preventive medicine should not be confined to sanitation, but must pervade all branches of medicine. Newman insisted that the purpose of preventive medicine was 'the removal of disease and physical inefficiency combined with the husbanding of the physical resources of the individual.' He believed synthesis and integration in medicine was necessary and ranked the areas of importance, putting medical research last on the list.[10] Heredity and race

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professorship at the Medical School. What won Hercus the job was his spirited exposition on preventive medicine, based on the work of Sir George Newman.

[6] Anon., "The preventive medicine of the future," *BMJ* 2 (1919): 502-3.

[7] C. E. Hercus, "The A.A.M.C. in Egypt," *BMJ* 1 (1919): 429-30.

[8] Brunton, *The medicine of the future,* 65.

[9] George Newman, *An outline of the practice of preventive medicine: a memorandum addressed to the Minister of Health* (London: H.M.S.O., 1926), 10.

[10] Newman, *Outline of preventive medicine,* 131. The full list is: Racial problems, Maternity, Infant welfare, The health and physique of the school child, Sanitation of the environment and control of the food supply, Industrial hygiene, Prevention of infectious disease, Prevention of non-infectious disease, Education of people in hygiene and Research., enquiry and investigation.

were of prime importance he said and there could be progress only if there were reductions in alcoholism, the incidence of syphilis and feeble-mindedness and degenerative processes caused by lead poisoning and tuberculosis. Commentators considered Newman's allusion to eugenics as 'bold' but these ideas were not unusual at the time: Regis Professor Sir Clifford Allbutt referred to heredity and disease in his address to the British Medical Association in London in 1919, and expressed a very similar advocacy for preventing disease as Newman.[11] He noted:

> Medicine has come to a new birth, and in this generation has fought on no unequal terms with other arms in a glorious campaign … It might be supposed that in war there would not be time to think, only to do; but we are surprised to receive enormous gifts to medical science from the great caravan of our returning pilgrims.[12]

Allbutt praised the advances in vaccine technology that had reduced the incidence of enteric fever among the troops compared with the situation in earlier wars where more men died of disease than of wounds. The emergence of the new medicine was he said, 'the enlargement from an art of observation and empiricism to an applied science founded on research.' Foremost in his praise for carrying out research was the University of Edinburgh's Medical School that he called: 'a technical school with its technical professoriate animated by an academic spirit.' Allbutt advocated medical research, much more than Newman did, even calling for laboratories to be 'established

[11] Clifford Allbutt, "The new birth of medicine," *BMJ* 1 (1919): 433-38.

[12] Ibid. 433.

in all Colonies.’ Hercus had been taught by professors trained in Edinburgh, who had brought with them a culture of research which he was to continue, investigating the health problems peculiar to New Zealand and its environment.

European settlers had arrived in New Zealand less than a century before Hercus was born and the country was largely unknown in terms of the scientific examination of its distinctive geology and associated soils and the effects these might be having on the health of the settlers. In attempts to make New Zealand more like Britain, people had imported European grasses to feed the farm animals they also imported into the country. These steps were to have health consequences for its population, ranging from hay fever and allergies from grass pollens to infection with animal diseases such as leptospirosis and hydatid disease. The deficient soils produced widespread endemic goitre, which also affected stock.

As a consequence of its recent settlement, New Zealand had a small population that was largely isolated from the rest of the world by distance. This was an advantage in keeping most epidemic diseases at bay and an advantage for researchers such as Hercus, who could study aspects of health, such as the incidence of endemic goitre in populations throughout the entire country. In addition to a small population in general, New Zealand had few scientists in the early twentieth century and even fewer medical researchers, most of whom were employed as professors and lecturers at the Otago Medical School (the School). The small scientific community learned to co-operate in research projects across different disciplines exemplified by Hercus’s goitre studies in which geologists, agricultural scientists, physicists and chemists assisted the medical researchers.

Later into Hercus’s career, the remoteness of New Zealand proved a spur to scientific research when wartime restrictions on shipping required the country to be less reliant on imported items. During the early 1940s, researchers investigated local sources of vitamins and fish liver oils previously obtained from Britain, opening up new areas of research.[13] Effective medicines were scarce prior to the advent of antibiotics that occurred at least two decades into Hercus's career, meaning that preventive medicine was all the more important. Fortuitously for medical research in New Zealand and at the School, Hercus was passionate about preventive medicine and public health and strived to improve the situation.

Hercus believed that research was essential for a medical school, and to that end made sure that he employed staff with a research interest. He felt it was essential to have research in every department. As Dean from 1937, he was a very important figure in society with immense prestige and ability to influence government in the cause of improving the health of the nation through medical research. He also had the advantage of being Dean of the only medical school in New Zealand at the time – there was little competition for funding or pressure to relocate the research to another institution during his tenure.

This thesis takes the form of medical biography, a traditional form of historical writing supplanted in the 1970s by the arrival of 'social history', or 'history from the bottom up.'[14] Traditional biographies were seen to offer a sanitised approach, ignoring the doctors' mistakes or failures, and ignored the patient. Social historians seek to

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[13] J.M. Mattingly, "Fish-liver oils: a wartime success story." In *New Zealand is different: chemical milestones in New Zealand history*, edited by Denis Hogan and Bryce Williamson, 104-11. Christchurch: Clerestory Press, 1999.

[14] Beth Linker, "Recuscitating the 'Great Doctor": the career of biography in medical history", in *The history and poetics of scientific biography*, ed. Thomas Soderqvist (Cornwall: MPG Books, 2007), 221.

recover the patient's view or that of the ordinary healer – basically any view that might challenge the elitist view of the 'great doctors'.[15] The two disciplines may not be mutually exclusive and it has been suggested that scholarly medical biography is needed to allow the field of the social history of medicine to mature.[16]

Medical biography has advantages in that it can present the history of medical ideas necessary for the understanding of the history of medicine. This thesis presents the evolution of research into endemic goitre in New Zealand, focusing on Hercus's contributions. It also focuses on Hercus's part in fostering research into many public health issues in New Zealand, mostly from within the School. Arguably, it may not completely fulfil the requirements of a medical biography in that it does not focus on his personal attributes or his private life and his family. In that this thesis also focuses on the history of scientific research in New Zealand where it impinged on Hercus's work, it may also be defined as a scientific biography, a 'sister discipline' to medical history, a field that suffered less impact from the social history movement in the 1970s.[17] Nye wrote that a scientific biography may not necessarily have technical science as its principal focus: it can examine scientific work and institutions, as this thesis aims to do.[18]

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[15] Ibid., 235.

[16] Ludmilla Jordanova, "Has the social history of medicine come of age?," *The Historical Journal* 36 (1993): 448.

[17] Ibid., 228.

[18] Mary Jo Nye, "Scientific biography: history of science by another means?," *Isis* 97 (2006): 329.

In recent years, there has been a reported resurgence in medical biography, often emerging as 'microhistories' in medical history journals.[19] The newer form of medical biography appears to be gaining acceptance a method to recognise the acheivements of a doctor, sympathise with his struggles, while taking into account his many mistakes which may add as moral lessons, wrote Frangos in 2010.[20] Framing this thesis as a medical biography has allowed me to focus on the evolution of research at the School over a well-defined period that encompassed not only Hercus's career but also included a period of major restructuring of scientific research after the first World War.

Aims of the thesis

The principal focus of this thesis will be on how Hercus fostered research at the School. Beginning with Hercus's introduction to research as a dental student and the publication of his first scientific paper, the thesis will follow his wartime experience as a highly decorated medical officer and his return to New Zealand at the end of the First World War. It will proceed to his employment as Professor of Bacteriology and Public Health and later still as Dean of the School. This thesis aims to follow this process to explain how these events shaped his future career and gave him the necessary managerial skills that were required at a time when scientific research was becoming increasingly important worldwide. It will also examine the development of the New Zealand Medical Research Council (MRC), a body largely set up through Hercus's efforts in 1937. The Council's research projects were almost all contained within the School for many years.

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[19] Constantine Frangos, "Towards a realistic approach to medical biography," *Journal of Medical Biography*, 18 (2010): 1.

[20] Ibid.

This thesis will investigate how Hercus's contributions added to the development of a national research culture.

How much of Hercus's success in fostering research at the School was due to the era in which he was most active, is another theme this thesis will explore. In no small way, the advances in bacteriology and endocrinology occurring after the First World War influenced his research as scientists learned new techniques and experimented on very limited numbers of animals or humans with few ethical considerations.

This thesis will explore Hercus's own contributions to research, especially in the field of endocrinology. In addition, it will assess how Hercus enhanced the School's reputation for research while improving the health of the people, particularly in preventing endemic goitre.

The period from 1914-1939 was increasingly one of seeking to improve the physical fitness of the population, not just to prevent illness but also to increase the birth rate of the European population. An important aim of this thesis is to investigate Hercus's contributions in this area including his work to establish the School of Physical Education in Dunedin, and promoting research to prevent maternal deaths and infantile mortality. In addition, the thesis will evaluate his motives, methods and successes exhibited throughout his career in the School, not the least of which was his ability to extract funding for research from the government, even in times of austerity. It will show how he provided the infrastructure necessary for research and more particularly for the experimental animals and their care.

Yet another source of help to Hercus was his senior medical students who, through producing a small research project of their own as part of their course requirements, were to provide him with much needed information on the health of the population for his research. This thesis will show how these students also spread his preventive medical message and actively immunised school children against infectious diseases. This thesis will also evaluate the impact the student investigations had on some of the students themselves with respect to continuing research projects of their own in their later careers.

Another theme will be an investigation into Hercus's relationship with the Department of Health and other government departments that he co-operated with in his research, New Zealand having such a small number of scientists that he needed their help in his nationwide studies. This thesis argues that this relationship, begun in 1920 when he worked as a Medical Officer in the Department of Health for a short time, was a mutually useful and fruitful one that ensured the success of many of his projects.

What drove Hercus to devote his life to preventing illness through medical research is another question this thesis will address. It will assess the influence of his wartime experiences in disease prevention had on his choice of career in public health and that of the National Efficiency movement. In addition, this thesis will explore how Britain's Sir George Newman's work in preventive medicine acted to inspire Hercus at a time when he was deciding which direction to take in his choice of career.

Part of Hercus's success in building up research programmes at the medical school was likely to be due to his immense capacity for work. His colleagues commented that Hercus was 'doing the work of four [or even six] men' in the years while he was Sub-Dean at the School.[21] In no small way, his wife and family helped in this.[22] This thesis is

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[21] Dean to Dr A.M. Drennan, October 10, 1934. ARC-0193 94-121-35 (1934) 'Hercus goes along much the same as usual doing about four men's work better than four individual men would do it.' A.M. Drennan, "Reunion," *Digest* 2 (1935) no.2: 23. 'The Sub-Dean, Dr Hercus, is also unchanged. He still does the work of six men in the time of one.'

about Hercus's public life but acknowledgement of their contribution is very important. As referred to later in this thesis, Mrs (later Lady) Hercus, science graduate of the University of Otego, actually assisted in one of Hercus's initial goitre studies. Later, she and the family assisted in providing overnight care for some of the goitrous lambs on their way from farms out of Dunedin, to the School. His daughter Mary remembers his being at the Medical School every Saturday morning and working at home on Sunday mornings. The family hosted many overseas visitors to the School, even during Second World War as well as providing temporary accommodation for new faculty members (such as the Eccles family) while they found homes.[23] Another generous action was to entertain the female students in their final year to afternoon tea at Hercus's home.[24] Margaret Guthrie recalls:

> There were ten women students in my year [1951] and he and Lady Hercus invited us one Saturday to afternoon tea at their place. They had a tennis court we could use. The men students had a long-standing tradition of having a dinner towards the end of the fifth year in spring to which women were not invited and Hercus's invitation was partly to make up for that.[25]

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[22] Interview with Mary Hercus-Rowe, September 22, 2010.

[23] Ibid.

[24] Interview with Dr Barbara Heslop, November 11, 2012.

[25] Interview with Margaret Guthrie, May 15, 2011.

Historiography

In 2011, on the 125th anniversary of public health teaching and research in the Department of Public Health and Social Medicine at the University of Otago Medical School, Warwick Brunton documented its history in his book, *The Medicine of the Future.*[26] Two chapters of the book feature the years that Hercus spent teaching in the department from 1922-1958, including brief biographical details and outlining his career. The book's focus is on the teaching and administration of the department, including its varying accommodation within the university campus and less so on Hercus's research interests and achievements, covering as it does the period from 1886 to 2011. By contrast, this thesis focuses on Hercus's research within the department and in the wider scientific community.

Brunton includes a discussion on the influence of the work of England's Chief Medical Officer for the Ministry of Health, Sir George Newman had on Hercus in his early years at the School. He also outlines Hercus's innovative teaching of public health through giving students the option of preparing dissertations based on their own research projects. These dissertations aided Hercus greatly in his own research and a discussion of several of these is included in Chapter Three of this thesis.

In addition, Brunton introduces Hercus's interest in the concept of 'social medicine', which he believed Hercus would have encountered on a trip to Britain in 1939, and later, John Ryle's exposition on it.[27] This is a theme explored in this thesis especially because of the impetus it appears to have made in the student choice of subjects for their

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[26] Brunton, *The medicine of the future*, 58-121.

[27] Ibid., 90; John A. Ryle, "Social medicine as a discipline," *British Journal of Industrial Medicine,* 2 (1945): 108-9.

dissertations after 1940. Brunton's book gives good insight into Hercus's other important roles within the School and the university as a whole, which this thesis does not cover.

Derek Dow also illustrates Hercus's life and career in his brief entry in *Te Ara Encyclopedia of New Zealand*, probably drawing on Hercus's autobiographical details in *The Otago Medical School under the First Three Deans,* co-written with Gordon Bell in 1964, and including later details such as Hercus's final illness and death in 1971.[28] This thesis adds considerably to Dow's necessarily succinct overview. Hercus and Bell's book covered the history of the School as a whole – its origin, growth and development up until Hercus's retirement in 1958. In writing this book, Hercus may have been concerned to govern how he was remembered, but as it is not altogether clear which author wrote the different sections, this is a moot question. Even Hercus's autobiographical section is written in the third person.[29] The book deals quite evenly with the periods of the 'three deans' but emphasises the devlopments of the Hercus period, as is proper when the explosions of scientific discoveries after two world wars is taken into account. Hercus was Sub-dean under Ferguson for three or four years.

The book contains no criticism of any of Hercus's actions, such as his acknowledged ruthlessness in seeking funding and facilities to further the School's research

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[28] Derek Dow, "Hercus, Charles Ernest," in *The Dictionary of New Zealand Biography Te Ara - Encyclopedia of New Zealand*, updated 9-October-2013. http://www.teara.govt.nz/en; C.E. Hercus and G. Bell, *The Otago Medical School under the first three deans* (Edinburgh: Lothian, Livingstone, 1964).

[29] Hercus and Bell, *The Three Deans*, 93. If he did write about himself "To have played such an essential role in the transformation [of the School] is only possible for a man of such high purpose and possessed of these qualities necessary to carry it through", it would be extraordinary.

programmes, thereby reducing the funding available for other researchers or for other university faculties.[30] His successor in the Department of Public Health, Preventive and Social Medicine claimed that Hercus had left much teaching to others and run down the teaching facilities in preference to focusing on research.[31] Not all the research staff that came to the School found the experience happy or rewarding and left. In this book the authors attribute these departures to the subjects' being offered positions elsewhere or retiring avoiding any suggestion of dissatisfaction. There are some omissions from the book such as the way in which Hercus actually gained his position at the School, though this had been covered in Carmalt Jones's book in 1945.[32] Despite these criticisms, the book offers a detailed description of the different departments of the School, the teaching and research personnel who contributed to the success of the School up until 1964.

On the centennial of the University of Otago in 1969, W.P. Morrell completed a history of the university in which he covers the controversy of the admission of foreigners ('persons holding German or Austrian qualifications') to the university.[33] Hercus had to deal with this situation as Dean of the School. Morrell also reports on Hercus's work to establish a School of Physical Education to improve the health of the nation's school children.[34] Morrell credits Hercus with setting up the Student Health Service and with playing a large part in formulating the university's long-range plan.

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[30] See Chapter Eight of this thesis.

[31] Ibid.

[32] See Chapter Two of this thesis.

[33] W.P. Morrell, *The University of Otago: a centennial history* (Dunedin: University of Otago Press, 1969), 154.

[34] Ibid. 159.

Gordon Parry wrote a sketch of the School in 1975, which includes a description of the earliest research projects on the osteology of the Maori and ends with the establishment of the Wellcome Institute near the School.[35] Much of the material in the book has been used elsewhere but he includes a discussion on some of the politics of instituting medical research in an age when vocational training was paramount and teaching an end in itself. He includes much praise for Hercus's ability to build research teams, encouraging others and for being instrumental in establishing the MRC.

In 2008, Dorothy Page produced a comprehensive history of the School, *Anatomy of a Medical School: a history of medicine at the University of Otago, 1875-2000.*[36] Using Hercus and Bell's book for a good deal of her book, Page covers some selected research projects and their lead researchers, adding interesting anecdotes. The sheer scope of her study precludes her giving any great coverage of Hercus's research achievements. This thesis aims to fill this gap in the history of research at the School and Hercus's role in the fostering of the work.

There are few comprehensive histories of the MRC apart from former Director, J.V. Hodge's review presented in *The New Zealand Medical Journal*, and an undated booklet in New Zealand Archives prepared to attract funding in the mid-1950s.[37] On the 25th anniversary of the Council in 1976, the Council prepared a research review with a

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[35] A. G. Parry, *Otago Medical School, 1875-1975: an historical sketch* (Dunedin: Medical School University of Otago, 1975).

[36] D. Page, *Anatomy of a Medical School: a history of medicine at the University of Otago, 1875-2000* (Dunedin, Otago University Press, 2008).

[37] J.V. Hodge, "Fifty years of health research," *NZMJ* 100 (1987): 449-51; Anon., "New Zealand Medical Research Council 1951," YCBN 5997 Box 16g (R773124) Archives New Zealand.

valuable contribution by H.D. Purves, Hercus's long-time co-researcher.[38] J.D. Sinclair also wrote an account of the origins of the Council, which exists in manuscript form in Archives New Zealand's Auckland Office.[39]

Many of the original research papers produced by staff of the School were reprinted in *The Proceedings of the Otago Medical School (The Proceedings)* from 1922. In 1988, Edwin Nye edited a collection of papers written by colleagues on the research projects of each Department of the School as published in *The Proceedings* between 1922 and 1997, thus extending past Hercus's time at the School.[40] Nye collated contributions from the Departments of Anatomy, Biochemistry, Microbiology, Pharmacology, Physiology, Medicine, Preventive and Social Medicine, Obstetrics and Gynaecology, Surgery and Transplantation. The reviews range from as few as four pages to 12. For the first 30 years of its publication, *The Proceedings* consisted of published articles but after 1950 contained a 'somewhat random' sample of staff research. There are long lists of published papers relating to each department but few refer to the early years in some departments. The essays introduce the key people in the School's departments over the years and the projects that they carried out.

Much of Hercus's medical research was closely aligned with the Department of Health. On his return to New Zealand at the conclusion of the First Word War, Hercus took up employment with the then 'Department of Public Health'. Geoffrey Rice's

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[38] Anon., *Research Review 1976*, YCBN 5997 Box 16g (R773124) Archives New Zealand; H.D. Purves, "Twenty years before the Act and after," in *Research Review 1976*, 42-7.

[39] J.D. Sinclair to RACP, 21/3/69, YCBN 5997 Box 16g (R773124) Archives New Zealand.

[40] Edwin Nye, ed., *Medical Research in Otago 1922-1997 as portrayed by 75 years of the Proceedings of the Otago Medical School* (Dunedin: Otago Medical Research Society, 1998).

comprehensive book on the influenza pandemic and its effects on the health of New Zealanders at that time provides context for this period of Hercus's career.[41] There were still sporadic outbreaks of the disease occurring after 1919, one of which warranted a newspaper comment from Hercus in his role as Junior Health Officer in 1920.[42] Rice wrote that the 1918 influenza pandemic was New Zealand's worst public health crisis that occurred at a time when the First World War had seriously depleted the country's medical resources. Hercus appears not to have left many reports on his experience with influenza, either as a subject of research or any observations during his career, but Rice's account of the pandemic and its effects on the structure and working of the Department, is relevant to this thesis. The book illustrates the state of public health in New Zealand at the time and how the Department and the government coped with the pandemic.

In a separate paper, Rice explores the making of the 1920 Health Act, a statute introduced as New Zealand's response the 1918 pandemic.[43] Britain and Canada set up health departments, as did Australia somewhat later, but New Zealand already had its own Department of Public Health. It also had a School Medical Service and a School Dental Service, which were reorganised by the 1920 Health Act into a Department of Health with seven Divisions, each with its own Director. The number of staff in each of the district health offices was to increase and Hercus was one of these for a time. Rice's

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[41] Geoffrey Rice, *Black November: the 1918 influenza pandemic in New Zealand* (Christchurch: Canterbury University Press, 2005), 41.

[42] "Influenza and the Runanga outbreak," *The Press*, March 4, 1920, 6.

[43] Geoffrey Rice, "The making of New Zealand's 1920 Health Act," *The New Zealand Journal of History* 22 (1988):3-22.

article introduces several of the medical men that Hercus would work with and their differing personalities and managerial styles.

Much of Hercus's research was into improving physical fitness, from his earliest experiences in the military in the First World War to his facilitating the establishment of a School of Physical Education at the University of Otago in the 1940s. This latter effort is not referred to in Charlotte Macdonald's book *Strong, beautiful and modern: National Fitness in New Zealand, Australia and Canada, 1935-1960.*[44] This omission is surprising as other authors give credit to Hercus for encouraging Philip Smithells to take up the position as Director of the School and for persuading the government and the university to co-operate in the venture. Macdonald discusses the contribution that Smithells made in the promotion of physical fitness in school children in her section on the development of physical fitness programmes in New Zealand and the formation of the Physical Education Branch of the Department of Education, which Smithells directed initially. Macdonald gives a comprehensive background of the evolution of the National Fitness programme in Britain against a background of the superior healthy and fit European countries represented at such events as the Berlin Olympics in 1936 and the Lingiad in Sweden the following year, which Hercus attended as a spectator and from which he drew much inspiration. Macdonald follows the passage of laws in Britain and New Zealand to improve physical fitness in 1937 and in Australia in 1938.

An earlier book also dealing with the improvement of the physical fitness of New Zealanders is Elizabeth Mathews' book, *Cora: a Wilding seed*, which follows the life of

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[44] Charlotte Macdonald, *Strong, beautiful and modern: National Fitness in New Zealand, Australia and Canada, 1935-1960* (Wellington: Bridget Williams Books, 2011).

Cora Wilding of Christchurch.[45] A curious omission from Hercus's introduction to his *Wilding Memorial Lecture* that he presented in 1940 was a mention of Cora Wilding or her work in initiating an alternative 'health camp' programme for children in New Zealand in the early 1930s.[46] Mathews investigates Cora's life and work with chapters devoted to specific periods of Cora's life. The chapters most relevant to this thesis discuss the influences of her visit to Europe where she observed the therapeutic use of sunlight (or UV light) on tuberculosis patients and children, which led to her establishing The Sunlight League on her return to New Zealand. Cora was also very much influenced by the poor state of physical fitness of the population and her writing gives context to the aims of the Department of Health in the medical examination of school children and Hercus in his role of preventive medicine. The book provides a background to Cora's personality and her ideas on health, some considered 'alternative' for the time, that may help explain the fact that Hercus omitted to mention her work.[47]

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[45] Elizabeth Mathews, *Cora: a Wilding Seed: an interpretation of Cora Wilding, M.B.E.* (Cheviot, NZ: lynx Books, 1999).

[46] C.E. Hercus, *Women and national survival: Wilding Memorial Lecture 1940*. (Christchurch: Whitcombe & Tombs, 1940). On the first page of the publication is a statement about the establishment of the lecture: 'In October, 1923, the Board of Governors of Canterbury College accepted a gift of £100 from Mrs Julia Wilding for the purpose of endowing a Lectureship in memory of Anthony Wilding and Gladys Wilding, M.A., son and daughter of the founder, and alumni of the College. The lecture is delivered biennially on some important topic relating to Women in Education and Social Life.' See Chapter One of this thesis for more on the *Wilding Memorial Lecture* and Hercus's preamble that relates to his acquaintanceship with the Wilding family.

[47] Mathews, "Cora," 102. 'With a flourish [Cora] turns back to that interest that gave her the first means of earning a living; alternative health.' This interest included studying the beliefs of the Finsen

By 1940, however, when Hercus gave his lecture, Cora was helping set up the Youth Hostels' movement, aimed at increasing levels of national physical fitness. Mathew's book has references to many of the people in medicine in the 1930s and 40s and people Hercus would have known, though does not mention Hercus or his work.

Margaret Tennant analysed the Children's Health Camp Movement in New Zealand and helped set The Sunlight League's health camps in perspective: there were several different 'health camps' in New Zealand, beginning with Dr Elizabeth Gunn's camp in November 1919 at Turakina.[48] Gunn was one of the first four school doctors appointed in 1912; another was Eleanor Baker, who was to work with Hercus on his first studies of endemic goitre. Tennant compares the ideology of the later established Sunlight League's health camps, with those run by the Department of Health and the co-operation of the League with school doctors and nurses. The League's camps placed greater emphasis on cultural activities awarding prizes to the 'camps' best citizen', while the children in Gunn's camps 'competed to gain the most weight.'[49] Tennant accessed some of Hercus's student dissertations for her book on which she based this paper. Several students visited health camps to report on how they were run and the success or otherwise of the venture. (There appear to be only six that survive in the collection,

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Institute in Copenhagen which claimed cures for a very wide range of medical conditions through the use of ultra violet rays.

[48] Margaret Tennant, "Children's Health Camps in New Zealand: the making of a movement," *Social History of Medicine*, 9 (1996): 69-87; "Sunlight League launched in Canterbury," *The Auckland Star*, May 15, 1932, 8. 'The inaugural meeting took place on May 14 and was attended by 'the foremost medical men. … Both the Health and Education Departments endorsed the camp movement, which also had the medical profession behind it.'

[49] Tennant, "Children's Health Camps," 82.

ranging in date from 1938 until 1947, when the Health Camps had become institutionalised and based on permanent camps.) Tennant claimed that the medical profession 'was on the whole supportive [of the camps]. … A cluster of research reports by senior medical students in the late 1930s and 1940s expressed doubts about the camps internal practices and long-term effectiveness, but these did not gain wide currency.'[50] It is not clear whether Hercus asked the students to study the camps but a reading of their acknowledgements in their dissertations suggests that he took great interest in their studies, not only guiding them in their choice of material to use and offering constructive criticism but also helping them to construct their work for presentation.

Several of Hercus's research projects have strong agricultural themes, such as his investigation into hay fever-causing plants, human diseases caught from farm animals and the analysis of crops and soils for iodine concentration important in his goitre studies. He interacted with many scientists from other disciplines in universities, government departments such as the Department of Agriculture, the Department of Scientific and Industrial Research (DSIR) and the independent Cawthron Institute. The development of grasslands in New Zealand was vitally important to the economy and by 1930 the country was nearly totally dependent on 'the growth of grass for conversion by cattle and sheep into dairy produce, wool and meat,' for its prosperity.[51]

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[50] Ibid., 86.; See Chapter Three of this thesis for a discussion on these dissertations.

[51] Paul Star and Tom Brooking, "The farmer, science and the State in New Zealand," in *Seeds of Empire: the environmental transformation of New Zealand*, ed. Tom Brooking and Eric Pawson (London: I.B. Taurus & Co Ltd, 2011), 159.

As Tom Brooking and Eric Pawson report in their book, *Seeds of Empire: the environmental transformation of New Zealand*, '[a]gricultural history is not well developed: much of what has been written is in the preserve of agricultural scientists or is locked away in local and family histories and ageing university theses.' While Brooking, Pawson and their contributing authors have made amends in their study of the evolution of grasslands in New Zealand, they have not mentioned the indirect effects on human health of the all-pervasive grass pollens in the form of hay fever. Hercus used some of the same source material as Brooking and Pawson in writing his papers on hay fever in the late 1920s and early 1930s, such as an article in the *New Zealand Journal of Agriculture* by A.H. Cockayne in 1918. Hercus worked with Alfred Cockayne, one of the earliest scientific investigators into the pollination of grasses and trees in New Zealand to establish pollen charts for Hercus in areas distant from Dunedin. Brooking and Pawson's book briefly refers to the establishment of the DSIR, a topic covered more fully by Michael Hoare in his paper "The Board of Science and Art 1913-1930: a precursor to the DSIR."[52] The Board published research papers on New Zealand science (mainly studies into geology and mineralogy as well as palaeontology and biology of native species of plants and animals) in *The New Zealand Journal of Science and Technology*, which it launched in 1918. Hoare's paper omits any reference to the contest the New Zealand Branch of the British Medical Association (NZBMA) and Hercus had in attempting to establish medical research on a better footing at the same time.

[52] Michael E. Hoare, "The Board of Science and Art 1913-1930: precursor to the DSIR", in *In Search of New Zealand's Scientific Heritage,* ed. M.E. Hoare and L.G. Bell (Bulletin 21, The Royal Society of New Zealand, 1983).

Parliamentarians discussed both issues in their debates and newspapers carried articles on the issues.

In his history of the New Zealand Department of Agriculture, Tony Nightingale provides a well-illustrated account for the general reader but very little on any research carried out in the years that Hercus was carrying out his goitre studies.[53] Nightingale covers the introduction of exotic grasses into New Zealand and the opposition by farmers of the inadequacy of using the British system of pasture management in this country, a movement that led to the founding of the Department in 1892. Relevant to this thesis is the history of the Plant Research Station at Palmerston North in 1928, at which one of Hercus's students studied plant pollens for his fifth-year dissertation, although by this date, the Station had been transferred to the DSIR.[54] Although Nightingale refers to some of the diseases caused by nutrient deficiencies of the soils, he does not mention the lack of iodine and the resultant incidence of goitre in livestock in certain areas of the country.[55] Accordingly, he does not report the Department's research in Central Otago in the late 1920s into the subject, work closely connected with Hercus's research into cases of human goitre.[56] Nightingale's book has only a passing

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[53] Tony Nightingale, *White coats and gumboots* (Palmerston North: The Dunmore Press Ltd., 1992).

[54] Ibid., 121; D.R. Armstrong, "Suggested scheme for a comprehensive study of atmospheric grass pollens in relation to pollen allergy in New Zealand" (Unpublished Student diss., University of Otago, 1945).

[55] C.E. Hercus, "Thyroid disease in New Zealand," Banting Memorial Lecture, *Canadian Medical Journal* 68 (1953): Hercus reported finding goitres in sheep, cattle, pigs and dogs.

[56] C.S.M. Hopkirk and C.V. Dayus, "Iodine deficiency and live-stock: a preliminary investigation in the Wanaka area," *New Zealand Journal of Agriculture* 40 (1930): 226-27. The Department of Agriculture followed this work by surveying a large part of the country for evidence of iodine

mention of hydatid disease in animals and no reference to any research by the Department of Agriculture, Sir Louis Barnett, Hercus and others at the School.

Further accounts of the history of agricultural science in New Zealand occur in a collection of essays in *Science in New Zealand,* edited by F.R. Callaghan.[57] The essays include a contribution by Hercus on medical science.[58] Compiled for a meeting of the Australian and New Zealand Association for the Advancement of Science (ANZAAS), held in Dunedin in January 1957, the book has brief histories on several topics relevant to this thesis, such as soil science and agriculture, and a brief foray into the disputed origins of the Maori and Polynesian peoples.

This latter topic includes reference to current thinking on the blood groups of the Maori – an area of research abandoned by Hercus in the mid-1920s, but continued by some of his students in their dissertations.[59] Why he chose not to publish this work is unknown; the notes are incomplete. As a man of his time, he would not have seen any

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deficiency in sheep between 1934 and 1940. For more on these surveys see http://rsnz.natlib.govt.nz/search/results.html?text=goitre+in+sheeprsnz.natlib.govt.nz.

[57] F.R. Callaghan, ed., *Science in New Zealand* (Wellington: A.H. & A.W. Reed, 1957).

[58] C.E. Hercus, "Medical Sciences," in *Science in New Zealand,* ed. F.R. Callaghan (Wellington: A.H. & A.W. Reed, 1957), 221-7.

[59] C.E. Hercus, "Anthropomorphic data", unpublished paper included as an Appendix in Allan North and Lester Suckling, Tuhoe- their teeth and thyroids: a public health survey of the Urewera Country with special reference to the above mentioned structures (Unpublished Student diss., University of Otago, 1937). 'An effort to determine the incidence of blood types was also made but considerable difficulties were encountered,' wrote Hercus, but he did collect data to calculate anthropomorphic indices for comparison with those of other tribes; F.B. Edmunson, "Blood groups in the Maori" (Unpublished student diss., University of Otago, 1935). Edmunson studied the Te Arawa tribe at Rotorua.

ethical problems in carrying out this colonial type of study – Professor John Halliday Scott, first Dean of the School had studied the 'Osteology of the Maori and the Moriori' in 1893, which Hercus and Bell claimed was 'the most substantial work on this subject.'[60]

The essays in *Science in New Zealand* reinforce the available documentation of the establishment of the Department of Scientific and Industrial Research (DSIR) and Sir Frank Heath's input. The DSIR was 'more or less [set up] according to the recommendations of Sir Frank Heath's report,' wrote I.D. Dick, Assistant Secretary of the DSIR, 'and reinforced the simple state of science in 1926.'[61] The essays on agricultural research traverse much the same ground as Tony Simpson's book with further reference to conquering soil-deficiencies and growing support for scientific research from the mid-1930s and the war years.

A large part of Hercus's success in fostering research at the School depended on his skill at obtaining the necessary funding required. In a notable example of this, he managed to persuade the Travis Bequest trustees to part with most of their available funding for some years, as related in Chapter Six of this thesis. In competition for the money from the Bequest was the New Zealand Branch of the British Empire Cancer Campaign Society, (NZBECCS). Rebecca Priestley introduces the history of this society in New Zealand in her book, *Mad on Radium*: *New Zealand in the Atomic Age.* She

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[60] Hercus and Bell, *The Three Deans*, 177; John H. Scott, "Contributions to the osteology of the aborigines of New Zealand and the Chatham Islands," *Transactions of the New Zealand Institute* 26 (1893): 1-64.

[61] I.D. Dick, "Historical introduction to New Zealand science," in *Science in New Zealand,* ed. F.R. Callaghan (Wellington: A.H. & A.W. Reed, 1957), 15.

elaborates on how the Travis Trust helped the establishment of the Travis Radiophysical Laboratory initially in Wellington in 1933 and its subsequent removal to Christchurch in 1937.[62] Priestley backgrounds the use of radium in New Zealand for medical purposes but not the introduction of radioactive iodine which Hercus's researchers were to use in the 1950s for endocrinology research. Her book is a an informative guide to the history of nuclear science in New Zealand as well as the public opposition to nuclear power in the late twentieth century. Research using radioactive iodine began in the School in the 1940s by Purves and Adams studying endocrinology. By the early 1950s, researchers of the MRC Endocrinology Committee were using radioactive iodine for thyroid diagnostic tests, for therapy in a small number of patients and for studying iodine metabolism of thyroid tumours.[63]

In 1964, F.S. Maclean wrote a history of public health in New Zealand, to which Hercus contributed the Foreword commending the book as fulfilling 'a much-needed function.'[64] Maclean presented chapters devoted to the history of individual diseases within New Zealand, the structure of the health authorities, the Department of Health and the country's Public Health Law. He includes Hercus's goitre research and his involvement with some diphtheria problems, but otherwise he does not cover the research work of the Medical School in any detail or that of the MRC. Dow claimed in 1995 that Maclean's book was 'very dated' and 'was already markedly anachronistic in

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[62] Rebecca Priestley, *Mad on radium: New Zealand in the atomic age,* (Auckland: Auckland University Press, 2012).

[63] 13th Annual Report of the Endocrinology Research Committee, YCBN 5977 A1279 Box 4/c 245/11 (R197250) MRC Endocrinology Research Committee – General 1951-1961.

[64] F.S. Maclean, *Challenge for health* (Wellington: Government Printer, 1964).

its structure and approach when it appeared in 1964.'[65] Dow's own history of the New Zealand Department of Health is a chronological documenting of development and change within the department without the detailed history of the individual diseases documented by Maclean and coverage of medical research is limited.[66] Dow includes some brief references to Hercus and the MRC. Maclean's book remains a valuable resource for historians as an overview 'of the epidemiology of the common infective diseases in New Zealand.'[67] There are several studies of individual diseases written since the publication of this book, such as theses on the history of tuberculosis, poliomyelitis goitre and hydatid disease in New Zealand.[68]

One of these was Deborah Dunsford's PhD thesis on the eradication of tuberculosis in New Zealand focuses on the social aspects of the programme and does not cover the basic research begun by Professor Sydney Champtaloup and continued by Hercus for many years at the School, or the scientific work of the MRC. The thesis does however include a mention of several of Hercus's fifth-year student dissertations investigating tuberculosis but no report or analysis of what they revealed. Dunsford relates Hercus's

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[65] Derek A. Dow, *Safeguarding the public health* (Wellington: Victoria University Press, 1995), 10.

[66] Ibid.

[67] Charles Hercus, foreword to *Challenge for health,* by F.S Maclean (Wellington: Government Printer, 1964), 5.

[68] Deborah Ann Dunsford, "Seeking the prize of eradication: a social history of tuberculosis in New Zealand from World War Two to the 1970s" (PhD diss., University of Auckland, 2008), Jean C Ross, "Mind over muscle: surviving polio in New Zealand" (MA diss., University of Canterbury, 1993), D. Brown, "Stepping-stone to cretinism: goitre in New Zealand" (BA(Hons) diss., University of Otago, 2000), H. Anderson, "Hydatids: a disease of human carelessness in New Zealand" (MA diss., University of Otago, 1997).

opposition to using the BCG (Bacille Calmette-Guérin) vaccine for tuberculosis but focuses mainly on the actions of the Department of Health in carrying out its large-scale eradication campaign, which lasted longer than the period covered by this thesis.

A major topic in this thesis is how Hercus helped to prevent endemic goitre in New Zealand and the consequences of this early research on his later career. Diana Brown's BA (Hons) thesis investigates much of his work in introducing iodised salt to eradicate goitre and the problems in setting the correct levels of iodine and having them accepted by the population.[69] Her thesis deals also with the continuation of the goitre research into thyroid research at the School and the consequences for New Zealanders today who are not taking in sufficient iodine. Although Hercus is possibly best known for research into the prevention of goitre his roles in research go much deeper and this thesis aims to elaborate on these and present the total range of his research. Diana Brown has written a second thesis on subjects pertinent to this thesis, this time on the life of Dr Muriel Bell, who worked in the School and with the MRC in the field of nutrition.[70] Brown discusses Hercus's support for the fluoridation of water supplies and his goitre studies. It also documents the working relationship with Professor Malcolm and with Hercus in nutrition at the School and with the School of Home Science.

Secondary to Hercus's goitre and thyroid research was his role in hydatid disease research and prevention. Honor Anderson has investigated hydatid disease comprehensively in her 1997 MA thesis and includes information gained from many of Hercus's student dissertations on the disease, even some completed following his

[69] Brown, "Goitre in New Zealand."

[70] Diana Brown, "Between lab and kitchen: the unconventional career of Dr Muriel Bell" (MA diss., University of Otago, 2006).

retirement in 1958.[71] Her thesis is helpful in explaining the shifting of the research unit from the School to a building on the Taieri Plains near Dunedin, where Hercus was to work in his retirement to continue his interest in hydatid prevention. Anderson's thesis covers the topic in great detail, having the advantage of being able to interview some of the important protagonists, such as Murray Gemmell for her study. As with the other single-subject studies, this thesis incorporates the hydatid study into the context of all Hercus's other roles and studies, including supervising the many student dissertations on the topic.

A subject seldom taken up for study by Hercus's students was poliomyelitis, perhaps due to its infrequent and unpredictable outbreaks. The studies provided Hercus with epidemiological data for outbreaks in 1925, 1937 and 1946. Jena Ross's 1993 thesis covers Hercus's role in facilitating research into poliomyelitis.[72] Her thesis investigates poliomyelitis epidemics through the years in New Zealand and the measures taken to prevent its spread. In addition to the post-graduate theses on individual disorders, there is one on the life and work of one of Hercus's researchers, Dr Walter Griesbach. Viola Schwartz's thesis documented the life of this Jewish refugee doctor who arrived in New Zealand in 1939 after fleeing Hitler's Germany. Hercus employed Griesbach to study thyroid disease.[73]

Erin Caswell's 2005 thesis investigated the situation that refugee medical practitioners found themselves in in New Zealand and at the School in the mid-1930s

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[71] Anderson, "Hydatid disease."

[72] Ross, "Mind over muscle."

[73] Viola Angelika Schwartz, *Walter Edwin Griesbach (1888-1968): life and work: pharmacologist, metabolic pathologist and endocrinologist* (Frankfurt am Main; New York, P.Lang, 2008).

and early 1940s.[74] The country was at war and many people questioned whether 'refugees of alien nationality should be allowed into the country.'[75] The situation intensified while Hercus was on a trip to Britain, Europe and the US in 1939 as there was 'a sudden influx of refugee doctors from Central Europe, chiefly German and Austrian Jews, but with some Christians and at least one Pole.'[76] The NZBMA and the Medical Council 'disliked the threat posed to its members', as did the Dental Association.[77] The New Zealand Returned Services' Association (R.S.A.) was vocal in its opposition and newspapers sensationalised reports of refugee activities.[78]

The refugee doctors had to re-train at the School 'at a time when the School had been doing its best to reduce the entry of its own nationals and had had to abandon its efforts on account of the public outcry it had aroused.'[79] This was a problem for Hercus as Dean and outside the scope of this thesis, which is of Hercus's contributions to the School's research projects and of his building up its research capacity to eventually encompass the work of the MRC.

Some of the refugee doctors who arrived in this period however, added greatly to his research effort. Dr Franz Bielschowsky and his wife Dr Marianne Bielschowksy arrived in 1946, by which time opposition to the arrival of immigrants had lessened.[80] Caswell

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[74] E.H. Caswell, "“An overdose of refugees”?: refugee medical practitioners in New Zealand, c.1930-c.1950" (BA(Hons) diss., University of Otago, 2005).

[75] Ibid.

[76] Carmalt Jones, *Annals*, 251.

[77] Caswell, "Refugee medical practitioners."

[78] Ibid.

[79] Carmalt Jones, *Annals*, 251.

[80] See Chapter Six of this thesis.

mentions Griesbach only briefly to say that he had applied to the Medical Council to re-qualify as a doctor, a move that surprised Schwartz in her thesis – Griesbach was nearly fifty years of age, but he was under pressure, she wrote.[81] The number of foreign medical men and women admitted to the country between 1930 and 1950 was not great – fewer than 30 re-qualified in New Zealand.[82] Caswell's thesis illustrates an unpleasant period of our country's history where anti-Semitism flourished and these refugees faced many hurdles to be accepted here.

As this thesis is a medical biography, it is important to establish the factors that influenced his career. Hercus entered medicine at a time when New Zealand was still a colony of the British Empire and had inherited many of the social problems imposed by the colonial system. In this context it is useful to consider David Arnold's introduction to the book *Imperial medicine and indigenous societies*.[83] Arnold analyses the role and impact of disease and medicine had on indigenous societies as the 'white man's' medicine transformed into public health in the late nineteenth and early twentieth century. Arnold explains how the ecological changes wrought by the early colonisers could have disastrous effects on the health of indigenous people and how colonial regimes set up health care systems to compensate. Although in his case, Arnold was referring mainly to the spread of diseases such as malaria through the expansion of irrigation channels in India, there are New Zealand parallels. Hercus's research covered the prevention of zoonoses such as brucellosis, leptospirosis and hydatid disease, all

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[81] Caswell, "Refugee medical practitioners"; Schwartz, *Walter Edwin Griesbach,* 24.

[82] Cawell, "Refugee medical practitioners."

[83] David Arnold, "Introduction: disease, medicine and empire," in *Imperial medicine and indigenous societies,* ed. David Arnold (Manchester: Manchester University Press, 1988), 1-26.

introduced with European farm animals onto lands cleared in the previous century for farmland.

Arnold argues that European contact brought disastrous consequences for native populations in colonies of the Empire as they succumbed to smallpox, plague, cholera and malaria, diseases that came to be associated with them rather than the rest of the population. This increased colonists' suspicions of the indigenous people for fear of infection. By the time Hercus was practising medicine, smallpox vaccination was common and only small outbreaks occurred, and diseases like cholera and plague were usually forestalled by quarantine measures and helped by New Zealand's distance from other countries that were likely sources of infection. Diseases such as typhoid and tuberculosis were common in Maori, partly because of their poor state of housing and general living conditions after colonisation. In several of their dissertations, Hercus's students reported that this was the case, even claiming that typhoid was 'almost confined to Maori communities and to mental institutions' by 1938.[84] The European settlers dominated the environment and this adversely affected the Maori population.

In the mid-1920s Hercus, looking for evidence of the detrimental influence of a Western diet on the Maori discovered an outbreak of typhoid in members of the Tuhoe tribe living deep in the Urewera forest of the North Island of New Zealand.[85] How Hercus instructed the tribe of on how to prevent typhoid is a prime example of Arnold's argument of how Western medical knowledge was transferred to an indigenous society following colonialism, (albeit its having been many years since European settlement of

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[84] J.T. Shearer, "Typhoid in Seacliff Mental Hospital" (Unpublished Student diss., University of Otago, 1938).

[85] See Chapter Two of this thesis.

New Zealand), and an example of European power being exerted over an indigenous people.

Malcolm Nicolson's chapter in Arnold's book discusses the changing European views of the Maori in the nineteenth century as expressed by four European members of the medical profession.[86] Although covering a period earlier than that when Hercus was actively carrying out research into Maori health, the doctors' views present a background to public opinion on the Maori. Dr Alfred Newman's opinion given in 1882 was that of the Maori as 'dying savages' whose demise was being hastened by the process of colonisation.[87] This was a common perception in this period of New Zealand's history as it was in other countries of the Pacific and lasted until the 1930s.[88] Alfred Newman was unsympathetic and blamed their deaths on consumption of European food, idleness, lessened fertility and weak constitutions. There was little wrong with the environment that would cause disease, he believed. By 1940, Hercus could report that 'as far as the Maoris are concerned, the last census reveals that their growth is healthy and assured, in sharp contrast … to the British population.'[89] There was nothing in the New Zealand environment that was 'incompatible with the healthy

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[86] Malcolm Nicholson, "Medicine and racial politics: changing images of the New Zealand Maori in the nineteenth century," in *Imperial medicine and indigenous societies,* ed. David Arnold (Manchester: Manchester University Press, 1988), 66-104.

[87] Alfred Newman, "Is New Zealand a healthy country?" 498-510.

[88] K.R. Howe, "The fate of the 'Savage' in Pacific historiography," *New Zealand Journal of History* 11 (1977) no. 2: 137-54.

[89] C.E. Hercus, *Women and National Survival: Wilding Memorial Lecture 1940* (Christchurch: Whitcombe & Tombs, 1940), 7.

growth of the human population,' he wrote. This was much the same conclusion drawn by Alfred Newman nearly sixty years earlier.

Arnold argues that expansion of the Empire brought with it the need to enforce sanitary and health measures to maintain a healthy colony leading to the introduction of laws to sanction them.[90] In New Zealand, this also led to the early establishment of the Department of Public Health. Arnold provides a framework for the work carried out by the Department (and Hercus to a limited extent) in vaccinating Maori against typhoid and smallpox. This intervention in Maori health inevitably involves European dominance over Maori. Arnold also discusses the difficulties with overcoming traditional medical practises and beliefs held by indigenous societies. This is an area Hercus did not publish an opinion on so is not covered in this thesis but others have, most comprehensively in the 'Maori Health Special Issue' of *Health and History,* to which Derek Dow contributes a paper on The Tohunga Suppression Act 1907 and the tohunga movement.[91]

Lynda Bryder, (a contributor also to the above issue), contributes a paper to *The history of public health and the modern state,* edited by Dorothy Porter, in which she investigates the health problems faced by Maori and Australian Aborigines. Bryder compares the treatment given by the different governmental public health systems treated the two populations. She claims that 'Public health in the early twentieth century aimed to improve the quality of the white population,' and only in recent years has there

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[90] Arnold, "Disease, medicine and empire," 12.

[91] *Health and History*: *Journal of the Australian Society of the History of Medicine*, 3 (2001); Derek A. Dow, '"Pruned of its dangers': The Tohunga Suppression Act 1907," *Health and History: Journal of the Australian Society of the History of Medicine,* 3 (2001): 41-64.

been 'some attempt to reverse this cultural insensitivity.'[92] In her article, Bryder compares public health developments in Australia and New Zealand over two hundred years, noting the close association of the two countries despite their different environments and set of problems inherited from the Old World, as well as different social and political economies.[93] She also highlights the inheritance by both countries of British medical traditions, including health legislation, the setting up of branches of the British Medical Association and methods of medical education. Her work offers background material for this thesis especially on the development of public health initiatives in New Zealand.

Dorothy Porter's edited collection of essays aimed to evaluate the work of George Rosen and to present a comparative 'history of public health policy in numerous political states in the modern era.'[94] Rosen wrote *A History of Public Health* in 1958, a work admired as 'a classic of public health history' by Elizabeth Fee in her introductory essay to an expanded volume published in 1993.[95] Hercus's early work in public health fits into Rosen's general framework although Rosen's context is public health initiatives in Britain and United States.[96] One of Hercus's roles was to oversee the work of the

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[92] Ibid., 328.

[93] Lynda Bryder, "A new world? Two hundred years of public health in Australia and New Zealand," in *The history of public health and the modern state*, ed. Dorothy Porter (Amsterdam: Editions Rodopi B.V., 1994): 313-35.

[94] Dorothy Porter, ed., *The history of public health and the modern state* (Amsterdam: Editions Rodopi B.V., 1994).

[95] Elizabeth Fee, "Public health, past and present: a shared social vision," in George Rosen, *A history of public health* (Baltimore: The John Hopkins University Press, 1993), ix-lxvii.

[96] George Rosen, *A history of public health* (Baltimore: The John Hopkins University Press, 1993).

pathology laboratory at Christchurch Hospital and was very much involved in bacteriology all his life. New Zealand had a ‘Department of Public Health’ by 1900, and a Government Bacteriologist and analytical laboratories in the four main centres soon after. Initially these laboratories carried out only chemical tests for adulteration of food and water. Rosen relates how the public health laboratory developed in the ‘Bacteriological Era’, which he defined as 1875-1950:

> The responsibility for the government to protect the health of the people is concretely exemplified in the public health laboratory. Furthermore, the laboratory represented the practical outcome of the microbiological period just as the organization of the health department had been a product of the earlier sanitary reform movement. … The public health laboratory provided a suitable scientific tool for the implementation of the public health program.[97]

Rosen uses diphtheria as an example of an infectious disease that was capable of being brought under control through accurate bacteriological testing and administration of diphtheria antitoxin by the early 1900s. A large part of Hercus’s teaching was in the use of vaccines and Schick testing for diphtheria in the 1920s, spreading into research as well, which showed that Rosen’s theory needed some modification – the vaccines would prevent the disease only with very careful handling, a fact backed up by the Bundaberg tragedy in Australia in 1928.[98] Rosen introduces the history many of the health problems that Hercus worked to prevent in his career, including maternal welfare, physical fitness,

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[97] Ibid., 311.

[98] See Chapter Five of this thesis.

poor nutrition, dental caries, and industrial hygiene. He also gives an account of the work of George Newman in Britain and the history of the examination of school children (the organisation of School Medical Services) as a way of improving public health, firstly in Brussels in 1874, followed by the United States in 1894 and Britain in 1907.

Dorothy Porter disagreed with the conclusions that Rosen presented though acknowledging that when he wrote it, public health did appear to be 'triumphant' in reducing mortality in the West and that infectious diseases were fast being conquered through the application of scientific research. 'Far from being solved, the world still faced many health problems,' she wrote. … '[P]ublic health was an expression of the way different societies addressed questions of social order and nationhood.'[99] The 1918 influenza pandemic sorely tested public health initiatives to prevent disease in New Zealand and elsewhere.

Source material

The primary sources of this thesis include official publications by the New Zealand Government, including *The Appendices to the Journals of the House of Representatives (AJHR).* In particular, it employs the section on Health (H-31) but also ventures into other sections such as Education, Scientific and Industrial Research and Agriculture. It also relies on the *New Zealand Parliamentary Debates* (*NZPD*) for material relating to funding of research and the setting up of the MRC. A major source is *The New Zealand Medical Journal (NZMJ)*, where Hercus and others at the School published a great deal

[99] Dorothy Porter, "Introduction," in *The history of public health and the modern state,* ed. Dorothy Porter (Amsterdam, Editions Rodopi B.V., 1994): 1.

of their work and which contain information relating to meetings of the NZBMA and other material relevant to this thesis. *The Proceedings* contain many reprinted papers from the *NZMJ* in a readily accessible form. Unfortunately, policy changes reduced these valuable publications in later years making them less useful in this respect for this thesis.

To a large extent, this thesis is based on archival material held in the Hocken Library in Dunedin, especially that relating to the Dean's Office of the Medical School. Included in them is correspondence between Hercus and former students serving in the Second World War in which he offers advice based on his own wartime experience, a subject he has otherwise left little record. In general, the files relate to the running of the department with limited amount of detail about his research.

This thesis also relies on files held at the Auckland, Wellington and Dunedin offices of Archives New Zealand, especially for information on the MRC. It is disappointing that the relevant material on the history of the MRC is split between Wellington and Auckland offices, making extra travel necessary.

A major source of information was the Papers Past website of the National Library. To date, the website is limited to certain years for individual newspapers which has restricted the information that I have been able to get ready access to, especially after 1945. To a lesser extent this thesis relies on microfilms of daily newspapers that have yet to be digitised and entered onto the website.

A major source of material used in this thesis is the Library of the Otago Medical School, namely its collection of student dissertations and the C.E. Hercus Collection: Public Health Reprints and Reports in the University of Otago Medical Library Historical Collection Room. Other primary and secondary sources include books and journals at the University of Canterbury libraries and the Cotter Medical History Trust library in Christchurch. The Trust holds a wide range of medical books including textbooks used by students at the School, copies of *The Proceedings*, histories of the School and files on early New Zealand doctors.

Several former students have contributed their views on Hercus especially in relation to completing their fifth-year dissertations and his daughter Mary Hercus-Rowe has kindly provided much insight into family life and support for her father's work. Other sources are included below in the outlines of individual chapters.

Thesis outline

The first chapter of this thesis, *Beginnings*, outlines some early milestones of Hercus's life including his education, his achievement of a dentistry degree before turning to medicine. It also examines his wartime experiences as a medical officer beginning with his membership of the Otago University Medical Company (OUMC) part of the Officers' Training Corps as a dental student and concluding with his return to New Zealand after the First World War, highly decorated and with a resolve to improve public health. The source material includes Hercus's military record spanning the years 1908-1950 and his few published accounts of his five years overseas service in Egypt, Gallipoli and the Western Front.

The chapter gives valuable background details for Hercus's future career, showing his interest in research demonstrated by his publishing his first paper while still a dental student and his role in preventing malaria in wartime. It will introduce Hercus's interest in the National Efficiency Movement. The following chapter documents his continuing interest in preventive medicine and his early employment with the Department of Health in Christchurch.

Chapter Two, *Hercus and the origins of scientific and medical research in New Zealand* covers the period up until his move into academia including a short apprenticeship in the Department of Health in Christchurch. It is in this intermediate period that Hercus teamed up with School Medical Officer, Eleanor Baker, to begin investigating the wide prevalence of endemic goitre in Canterbury's school children. Many of the facts in this chapter come from government sources, such as *The New Zealand Gazette* and the *AJHR*, especially those relating to Hercus's early employment with the Department of Health.

This chapter also establishes the state of post-war scientific and medical research both in New Zealand and Australia and the consensus that more needed to be done. The situation at the School compared favourably with that in Australian medical schools but was still unsatisfactory. The chapter includes an outline of the early research projects at the School into nutrition, osteology and toxicology. The passing of the 1920 Health Act in New Zealand promised a new beginning in public health, spurred on by the rallying messages of Sir George Newman. The chapter follows Hercus's transfer to Dunedin and his appointment as Professor of Bacteriology and Public Health at the School in 1922 and his research into the dental health of the Maori in the Urewera Country in late 1924 and early 1925.

The following chapter, *The Student Dissertations*, uses material from interviews with former students to build up a picture of Hercus's programme of teaching public health through having the students perform a research project of their own (or in pairs) and present it to him and to their classmates. The chapter illustrates the changing emphases on public health and preventive medicine through the Hercus years at the School and his influence on the topics chosen for study. The benefits to the students are not always obvious but some interviewees now aged up to their mid-nineties reported that they definitely found the exercise rewarding.

This chapter includes extracts from published dissertations collated from *The New Zealand Medical Journal,* autobiographies and biographies of former students. The dissertations are held as a Special Collection at the Library of the University of Otago Medical School in Dunedin. This chapter makes a vital contribution to the thesis in explaining how Hercus co-operated with his senior students to advance research into a wide range of public health issues. The research from these students forms a substantial element in the primary base of this thesis.

Hercus's major research project in the prevention of goitre is covered in Chapter Four, *Conquering endemic goitre 1920-1937,* which documents the development of the project, his leadership skills in co-ordinating a multi-disciplinary study and eventual victory in solving the mystery of why endemic goitre occurred in New Zealand and formulating preventive measures. The chapter concludes in 1937, not because he had won the battle against goitre but because in that year Hercus became Dean of the Medical School, an influential role that aided his aim of establishing a medical research council largely sited within the School.

Sources for this chapter include his many published papers which featured in the British *Journal of Hygiene* and *The New Zealand Medical Journal,* as well as articles featured in daily newspapers accessed through the Papers Past website of the National Library of New Zealand. It also introduces several of Hercus's fifth-year student dissertations which focused on helping his battle against public ignorance relating to endemic goitre and providing much-needed statistics for him. The chapter contributes to the argument of this thesis that Hercus fostered research at the School in detailing Hercus's own research programme and his ability to create a network of scientists to help solve a very serious health issue for New Zealanders. It also shows how Hercus employed not only exceptional researchers to assist in this work, but also encouraged his senior students to participate.

Hercus's research efforts were not limited to one topic and Chapter Five, *Hercus and the development of preventive medicine in New Zealand* investigates the beginnings of research into the infectious diseases of diphtheria, smallpox and hydatid disease as well as research into hay fever. Hercus and his colleagues carried out the work against the background of appeals for a medical institute to be set up at the School and the establishment of the DSIR in 1926. A reluctant government declined to co-operate with pleas from Hercus and the NZBMA to put medical research on a better footing by establishing a medical research institute.

The chapter argues that apparently undaunted, Hercus facilitated several research projects, some of which were ambitious for the time, such as an investigation into poliomyelitis, and one into the emerging problem of hay fever mainly induced by pollen from English grasses sown by New Zealand farmers. The lack of suitable funding is a constant theme as is the help Hercus received from his students' research.

Also in this chapter is evidence that Hercus could carry out research projects on a very limited budget, again with help from his students. Sources for this chapter are journal publications, the student dissertations, daily newspapers and government sources, including the *NZPD*. The chapter sets the scene for the establishment of the Medical Research Council, largely sited within the School, by identifying the many research projects already in place as evidence of superiority in where the council should be located. The following chapter covers some of the more substantial research programmes under investigation within the School.

Chapter Six, *Private funding and the Medical Research Council* contends that the formation of the Council in 1937/8 was one of Hercus's greatest contributions to medical research in New Zealand and to that of the School. The chapter illustrates Hercus's tenacity in obtaining funding for research that extended to resorting to legal action to claim the bulk of the Travis Bequest for an investigation into tuberculosis in the School. The chapter also covers the initially unhappy siting of cancer research as a separate unit financed by the NZBECCS within the School.

Sources for this chapter include John Wilson's book on Henry William Travis and his Trust, which follows the evolution of apportioning Travis's bequest within the Medical School, and contemporary newspaper accounts of the issues involved.[100] The chapter also includes retrospective accounts by Dr H.D. Purves on the fortunes of research carried out by the NZBECCS at the School.

The chapter will expose the minor controversies relating to who was most responsible for setting up the MRC, but will argue that Hercus, now Dean of the School, was the main instigator. It will also show the uniqueness of having nearly all the research projects located in a university Medical School through a comparison with the situation in comparable Australian schools. The chapter follows the development of the MRC, its early projects and its reconstitution in 1951. It will also illustrate Hercus's involvement in many of these projects. In addition, this chapter will show how Hercus employed refugee doctors, who helped the School gain international success in endocrinology and cancer research.

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[100] John Wilson, *William Henry Travis 1853-1927, the W.H. Travis Trust 1927-1987* (Christchurch: The Trust, 1987).

Material for this chapter is contained mainly in archival material held at the Hocken Library in Dunedin and in Archives New Zealand offices in Wellington, including Michael Watt's unpublished autobiography.[101] The sources for the research work are in medical journals such as *The New Zealand Medical Journal*, prestigious lectures given by Hercus, the proceedings of the 1946 Empire Science Conference and Carmalt Jones's book on the history of the School.[102] This chapter begins to bring together the research with which Hercus was involved in the period 1937-50, a task that no other thesis writer appears to have attempted to date.

The following chapter (Seven) further illustrates the growing research projects at the School. Entitled *The MRC expands and matures and expands,* this chapter focuses on the doubling of the initial six research committees. It is largely restricted to the committees that Hercus was personally involved with – the Nutrition Committee and the Island Territories Research Committee, but it also covers the Dental Research Committee, another area of interest to him. The chapter concludes with Hercus's role on the Advisory Council of the Life Insurance Medical Research Fund of Australia and New Zealand, which brought funding to the School for Smirk's hypertension research. Also included in this chapter is an important section on Hercus's role in the provision of laboratory animals and their care within the School, an accomplishment that made the School unique in the Commonwealth. The material for this chapter is largely derived

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[101] Michael Watt, *The rest of the day to myself*, MSY-3874 Unpublished manuscript, 1957. Alexander Turnbull Library.

[102] Carmalt Jones, *Annals*.

from archival sources including the Hercus Collection held in the Medical School Library and Hercus and Bell's book on the history of the School.[103]

The concluding chapter (Chapter Eight) draws together the events that inspired Hercus to take up a career in medical research, the influence of the army and people such as Pickerill and Newman. It also shows the increasing influence of the concept of social medicine on Hercus's teaching and research. This chapter also investigates Hercus's skills in driving the research projects, his attainment of funding and his detractors within the university and the Department of Health, before suggesting where this thesis sits in the historiography of scientific and medical research in New Zealand.

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[103] Hercus and Bell, *The Three Deans*.

Chapter One: Beginnings

> *And let us not forget how many of the greatest men in medical history, from the wars of cloud-topped Ilion to those of Greece and Rome, and of modern times, had been on military service*.—Sir Clifford Allbutt, 1919[1]

Introduction

There were many important factors contributing to Sir Charles Hercus's success in fostering medical research that one can attribute to his upbringing and to his acquiring important leadership skills in the army during the First World War. Hercus spent his formative years in Christchurch before moving to Dunedin in 1908 to study dentistry under Henry Pickerill who was later to gain fame as a plastic surgeon. Hercus wrote his first academic paper with Pickerill, who convinced him to study medicine on completing his dentistry degree.

Caught up in the fervour of the First World War, just as he finished his medical degree, Hercus embarked with the Main Body of the New Zealand Expeditionary Force in October 1914 as a Medical Officer with the Mounted Field Ambulance of the New Zealand Medical Corps. He had been amongst the first to sign up with the Otago Medical Officers Corps while a dental student in 1909. After serving with great distinction in Gallipoli and Palestine, he arrived back in New Zealand in 1919 ready to begin a more settled medical career.

The Hercus family

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[1] Allbutt, "The new birth of medicine," 434.

Charles Ernest Hercus was born in 1888 in Dunedin to Peter and Elizabeth Jane (née Proctor), their third child.[2] The Hercus family arrived in Dunedin from Orkney, 'the misty isles of the remote north' in the 1860s.[3] Hercus believed that the family may have had Norse ancestry and that it was not surprising that his forbears had migrated to New Zealand noting their seafaring history.[4] A former student and research associate Dr Duncan Adams believes that much of Hercus's character was due to his Norse ancestry: 'Hercus was a Viking from the Shetland Islands. His successful career was not due to any military skills but to his being a very courageous man in dealing with life. He was fearless in seeking to use all available talented people for getting rid of disease.'[5]

Peter Hercus worked initially as a clerk and then a commercial traveller for Ross and Glendining Ltd., a woollen manufacturer in Dunedin, as did his older brother George, the company's accountant. The family had a commercial background: Peter's father was shipping merchant, and an even earlier ancestor had been in the woollen trade as a weaver in Orkney.[6] In the late 1880s the New Zealand economy 'rested on wool' and 'the squatter was king.'[7] In addition, the introduction of the frozen meat trade and technology to permit industrial butter manufacture

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[2] Hercus was one of five siblings, three girls and two boys.

[3] Ann and John Hercus, *From Orkney to Otago, 600 years of Hercus family history* (Christchurch: J. Hercus, 2006), 78; Hercus and Bell, *The Three Deans*, 85-86.

[4]Ibid.

[5] Interview with Duncan Adams, 2011; Duncan Adams, "The legacy of Sir Charles Hercus," *NZMJ* 123 (2010): 97.

[6] Hercus, *Orkney to Otago*, 78.

[7] Keith Sinclair, *A history of New Zealand* (Auckland: Penguin, 2000), 174.

emphasised the dependence on agrarian exports, which were largely sold to Britain. There was considerable unemployment with people denied access to land and there was poverty in the towns. The period of the 1880s has often been referred to as the 'Long Depression', but it 'has since been debated in the face of strong evidence that there was a vigorous small industrial economy, certainly in places like Dunedin.'[8] With unemployment came unrest and the election of the Liberal Party in 1890 on a mandate to promote closer settlement of the land, labour and tariff reforms.

The Hercus family moved to Christchurch in 1891 when Peter became Ross and Glendining's Christchurch warehouse manager. He later took a managerial position at Kaiapoi Woollen Mills sometime between 1894 and 1896, at the company's warehouse in Lichfield Street, Christchurch. Peter Hercus was the Christchurch representative of the New Zealand Medical Association in his later years.[9] The family lived mostly in the St Albans/Merivale areas while Hercus was at school.[10] Hercus described his childhood and youth in Christchurch as

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[8] Matthew Wright, *Illustrated history of New Zealand* (Auckland: David Bateman, 2013), 186-7.

[9] "Mr Peter Hercus," *The Press*, January 17, 1958, 8.

[10] Although the family lived much the same area throughout Hercus's schooldays, He attended three primary schools – Christchurch Normal in 1896, Elmwood School in 1897-98 and Fendalton Open-air School for his last two years. In 1908, the family lived at 293 Cambridge Terrace, much closer to the city, where Peter worked at Kaiapoi Woollen Manufacturing Company Ltd., which had its offices in Cashel Street. In about 1910, while Hercus was studying in Dunedin, the family shifted to a house called 'Awarua' in Opawa where his sisters were baptised in the Presbyterian Church, aged 15 and 20 years. His elder sister Eliza was married in a marquée in the garden of this house in 1911. The family was still at this address while Hercus and his older brother Arthur Farquarson Hercus were serving overseas during the First World War.

> [following] the pattern of those days, living a partly urban, partly rural existence which inculcated the elemental virtues of self-help, independence and enterprise, that were the heritage of colonial boys of that relatively simple stage of New Zealand history.[11]

Hercus attended Christchurch Boys' High School for four years, which he considered himself fortunate to do. Few children stayed at school after the age of thirteen in the early twentieth century, and most of his classmates who enrolled in 1901 left after three years. While at the school he joined the school's Cadet Corps, which had been established in the late 1880s as a response to the Boer War and the Russian scare, which 'threatened the strong bonds of empire.'[12] He much admired the headmaster C.E. Bevan Brown and corresponded with him while serving in Palestine in 1918, thanking him and the school for backing its ex-pupils 'through these long, weary years of war.'[13] In February of that year, he had received the school's magazine and a

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[11] Hercus and Bell, *The Three Deans,* 86.

[12] Leonard Thornton, "The school and the armed services," in *The years between: Christchurch Boys' High School 1881-1981*, edited by A.T. Campbell (Christchurch: Christchurch Old Boys' Association, 1981), 183; Anon., "Cadets," in *Christchurch Boy's High School Magazine, Term 3, 1904*, 90. Hercus was a Corporal in No. 2 Company in 1904.

[13] Charles E. Hercus, "Letter from Palestine," 7 February, 1918 in *Christchurch Boy's High School Magazine* 58 (May 1918): 19-21; "Major C.E. Hercus writes from El Arish, 31/1/17," in *Christchurch Boy's High School Magazine* Special Number (August 1917): 19-20. Hercus wrote following receipt of his 1916 Christmas parcel, the funds for which had been found through 'the self-

Christmas present while at the front, 'after what seemed like an interminable time without mail.'[14] Another reference to his schooldays appears in the 1940 *Wilding Memorial Lecture*, which Canterbury College invited Hercus to give.[15] The lectures were set up to honour the lives of tennis champion, Frank Wilding and his sister Gladys who had both died prematurely. Hercus spoke of his friendship and admiration for Frank Wilding at Christchurch Boys' High School and his own interest in tennis.

In 1904, on leaving secondary school, Hercus had to decide on a career, a decision likely to have been influenced by his father's admirable public service. Peter Hercus was an important member of the business scene in Christchurch, as a member of the Christchurch Branch of the Industrial Association of Canterbury, being president in 1911-1912. He was Chairman of St John in Christchurch in 1907.[16] Peter oversaw the purchase of 'the very latest type of ambulance brougham', which was exhibited by the Department of Public Health at the New Zealand International Exhibition in 1906.[17] It is hard to imagine that Peter's association with these organisations did not play a part in his son's choice of a career. St John ran first aid and nursing courses, as well as fund-raising efforts but it is not known if Hercus attended any of them. Later, Peter

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sacrifice of the boys in again forgoing the sports prizes.' These school magazines were highly prized by the old boys serving overseas and acted to keep them informed on the fate of their classmates.

[14] Ibid.

[15] Hercus, *Wilding Memorial Lecture,* 2.

[16] G.W. Rice, *The Order of St John*, (Christchurch: Order of St John, 1994), 72.

[17] Ibid.; James Cowan, *Official Record of the New Zealand International Exhibition of Arts and Industries held at Christchurch, 1906-07* (Wellington, Government Print, 1910), 59 and 62. Peter Hercus served on two of the organising committees for the exhibition.

Hercus was the Christchurch representative of the New Zealand Medical Assurance Society.[18]

Hercus studies dentistry

Inspired by a family friend who was 'successful dental practitioner', he enrolled as one of the first three students in the four-year Bachelor of Dentistry at the new Dental School in Dunedin in 1908.[19] It appears that Hercus was able to undertake the first year of the dental course at Canterbury College as 'special lectures were arranged [for two students] on payment of special fees [in 1907] … apparently preferring that to attending lectures in Dunedin.'[20] Prior to the opening of the school, dentists had trained by apprenticeship to a registered dentist.[21] T.K. Sidey, Member of Parliament for Caversham in Dunedin, pushed for the establishment of a school as early as 1903, with the support of dentists in Dunedin.[22] The amount of dental work required by the community was rapidly increasing. The University Council had no funding available to

[18] "Mr Peter Hercus," *The Press*, January 17, 1958, 8. Peter Hercus died on January 16, 1958, aged 96 years.

[19] "The Dental School," *Otago Witness*, April 8, 1908, 33. The School opened officially in April 1908: T.W.H. Brooking, *A history of dentistry in New Zealand* (Dunedin: New Zealand Dental Council, 1980), 163. The other two men who graduated with Hercus were W.A. Seed and A.J. Hansen.

[20] "Untitled," *Otago Daily Times* April 1, 1908, 5; A.T. Campbell, ed., *The years between: Christchurch Boys' High School 1881-1981* (Christchurch, Christchurch Old Boys' Association, 1981), 437. William Seed had been a classmate of Hercus at Christchurch Boys' High School and is likely to have been the second student mentioned.

[21] "A Dental School for New Zealand," *The Press*, June 12, 1903, 4.

[22] Ibid., June 1, 1903, 3.

build a dental institute in 1903. In 1906, the dentists of the colony raised £1000 to build a dental school and the Government gave £1500 and '10 or 11 of the dentists in Dunedin' gave their services voluntarily to ensure that the school was a success.[23]

Hercus chose to study dentistry at a very important time in the life of the Dental School. It was a brand-new degree in a new building in Dunedin and with an exceptionally well-qualified and enthusiastic director – Henry Percy Pickerill. Only 28-years-old when he arrived in New Zealand with dental and medical qualifications gained in England. Hercus and two other men were the first to undertake the four-year Bachelor of Dentistry degree, but there were other students at the Dental School, who had served apprenticeships with established dentists and were completing final qualifications. The Dental School was extremely busy right from the start, not because there were insufficient students, but because of the poor state of people's teeth, Pickerill said at the opening of the School in 1908.[24]

The influence on Hercus of such an energetic and skilled teacher as Pickerill was to prove very important, even though ultimately Hercus chose to practice medicine and not dentistry. Pickerill taught most of the classes for the course – pathology, bacteriology, orthodontics, dental mechanics and dental surgery.[25] With so few students, the classes and instruction must have been very personal. Pickerill extended his dentistry instruction to include medical students by introducing a short course for them in 1909 and was 'much gratified at the interest taken in the subject by the

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[23] "The Dental School," *Otago Witness*, April 8, 1908, 33.

[24] Harvey Brown, *Pickerill*: *Pioneer plastic surgeon, dental education and dental research* (Dunedin: Otago University Press, 2007), 55.

[25] Ibid., 64.

students.'[26] Hercus published his first academic paper in 1910 as a report of his assisting Pickerill to operate on a patient with facial injuries after being thrown from and kicked by a horse.[27] In October 1958, when Hercus was about to retire from the School an anonymous valedictory in the medical students' magazine reported that 'After a short period of research into dental caries and prosthetic dentistry, [Hercus] proceeded with medical studies,' indicating some further work that may not have been published.[28]

The dental course was Hercus's introduction to bacteriology, a subject in its infancy but one that captured his interest – he later called himself a 'bacteriologist'.[29] The laboratory conditions were inadequate at the Dental School until 1910 when Pickerill obtained a pathology laboratory, which was well equipped with microscopes and 'all the bacteriological apparatus necessary.'[30]

In what is reminiscent of Hercus's later battle to eliminate endemic goitre by means of educational propaganda, Pickerill pleaded for dentists to promote health on a broad scale – 'to replace ignorance with knowledge.'[31] New Zealanders' teeth were in an appalling state and the answer to improving them did not lie in a surgical approach of fillings and extractions.[32] His emphasis was on improving poor oral health, which

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[26] H. Percy Pickerill, "Dental teaching for medical students," *BMJ* 2 (1909): 420-1.

[27] C.E. Hercus, "Case of fracture of the upper and lower jaws," *NZDJ* 6 (1910): 62-3.

[28] Anon., "Sir Charles Hercus," *Digest* 5 (1958): 6.

[29] C.E. Hercus, "Some preventive and research aspects of surgery: The George Adlington Syme Oration," *Australian and New Zealand Journal of Surgery* 7 (1937): 5.

[30] Brown, *Pickerill*, 63.

[31] Ibid., 55.

[32] Brown, *Pickerill*, 4-5.

contributed to poor diet and nutrition. 'Dental disease was just as dangerous [as tuberculosis, fever and alcoholism] and next to nothing had been done. It was treated with a deadly apathy that almost amounted to fatalism,' Pickerill said in his public address at the opening of the Dental School in 1908.[33] Pickerill found child-care practices and hygiene standards were inadequate and encouraged dentists to support the recently formed Plunket Society, which aimed to improve child health. Being exposed to such rhetoric and the emphasis on prevention of disease was likely to have inspired Hercus in choosing a career in public health.

Dental research in the Maori

Another early influence on Hercus was Pickerill's research into dental caries, and in particular amongst the Maori. In the early years of the twentieth century, some of the lecturers at the Medical School were intrigued by the Maori, their way of life, their physical attributes and their diet, which was said to prevent dental caries – at least in the collections of skulls and teeth held at the School. Pickerill did not publish this work until after Hercus had left the Dental School, but the fact that it also involved Professor Sydney Champtaloup, Professor of Bacteriology and Public Health at the Otago Medical School (where Hercus was now studying medicine) makes it very likely that Hercus was aware of the work. He certainly did know about it later and found the work an inspiration for his own research.

People were quite curious about the 'conditions of life of the Natives of the Urewera Country', a remote sparsely occupied area of the North Island of New Zealand, and if their teeth were free from caries as suggested by scientists who had studied museum

[33] Ibid., 53.

collections of Maori skulls and teeth.[34] Those who did venture into the area often wrote about their experiences with great enthusiasm, describing the rugged trip through native forests using packhorses.[35] This is how Albert Henderson gave his impressions of visiting the area:

> The Urewera Country, lying between Lake Waikeremoana and Whakatane within the North Island of New Zealand has to many the attraction of the unknown and a trip into its mountain forests inhabited by primitive Maoris has attractions for which the tourist or sportsman is willing to pay a handsome figure.[36]

Pickerill and Champtaloup planned a visit to the Urewera Country to settle the issue because the museum studies were 'too varied' to provide the truth about the state of Maori teeth. Were there differences in the number of putrefactive and acid-forming

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[34] H.P. Pickerill and S.T. Champtaloup, "An investigation into the causes of immunity to dental disease in the Maori of the Urewera," *NZDJ* 9 (1914): 169; C. E. Hercus, "A comparative study on the diet and teeth of the Maori," unpublished manuscript, 1925, Appendix in North and Suckling, "Tuhoe - their teeth and thyroids"; Truby King, *The story of the teeth and how to save them* (Auckland: Whitcombe & Tombs, 1935), 6. '…the old-time Maori … chewed and ground tough fern-root between his molars, as millstones grind corn, until his jaws were tired with the healthy exertion – an excellent check on over-eating.'

[35] Pickerill and Champtaloup, "Dental immunity," 170; Albert Henderson, *Account of trip to Maungapohatu*, The Alexander Turnbull Library Acc 87-201, 1-3; Hercus to Lindo Ferguson, January 3, 1925. ARC-0193 94-121/16 (1925).

[36] Albert Henderson, *Account of trip to Maungapohatu*, 1.

bacteria in the mouths of Maori who ate a traditional diet? Following the example of dental researchers in other countries with native populations seemingly immune to dental caries, the two men planned to study

> the bacteriology of the mouths of Maori children immune to caries and living as far as possible from ordinary civilized conditions as possible. The Uriwera (sic) Reserve was chosen for this purpose, and the majority of the villages were inspected in 1912.[37]

Champtaloup was unable to leave his laboratory for this trip (he was Government Analyst as well as a lecturer at the Medical School), so Pickerill went alone to collect swabs of oral bacteria from the Maori children and to study their diet.[38] Taking the advice of Government Survey Department officers, and guided by a Maori interpreter, Pickerill set out to find Maungapohatu, the Maori prophet Rua's headquarters, deep in the Urewera Country.[39] Rua's site was deserted, forcing Pickerill to visit other pa sites for subjects to study. Nowhere in his report does he say how many children he examined, but he did find 50 with no dental caries to study. 'I found more caries than I had hoped to find, but still only to a very slight extent in any one mouth, and I saw more perfect sets of teeth than I had ever seen before'.[40] A report in *The Evening Post*

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[37] S.T. Pickerill, *The prevention of dental caries and oral sepsis* (London: Bailliere, Tindal & Cox, 1914), 28.

[38] Pickerill and Champtaloup, "Dental immunity," 169.

[39] Ibid.

[40] Ibid., 170.

on March 1, 1928 of a similar study carried out by ‘a well-known Auckland dentist’, claimed that Pickerill found 99 percent of the Maori children had no dental caries, but this percentage is not mentioned in Pickerill’s work.[41] The article also refers to Pickerill’s finding the varied diet of the Maori being mostly fruit, roots and berries. In fact, Pickerill said:

> As regards food, I found that in great part, the Maori have forgotten the food of their ancestors. At present their principal diet seems to be riwai, kumara, maize (rotten), pig, and occasionally mutton. Fruit grows wild in the country and they are very fond of it, but I did not ascertain that they stored it at all. European flour, tea and sugar, they are all very anxious to obtain, and when it is obtained consume in considerable quantity until the stock is exhausted.[42]

Pickerill encountered many technical difficulties with his studies – sending the oral swabs back to Champtaloup in Dunedin for him to analyse took a whole week, reducing the chances of culturing any bacteria they may have contained. He was unable to find any differences in the oral bacterial flora of the Maori children when compared with Europeans. He and Champtaloup revisited the area in late 1913, taking a full set of laboratory equipment, which they installed in a shed provided by the Government Health Department.[43] They chose 50 ‘perfectly immune children’ to study

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[41] “Maoris’ teeth: influence of foods,” *Evening Post*, March 1, 1928, 10.

[42] Pickerill and Champtaloup, “Dental immunity,” 171.

[43] Ibid., 178.

from the pas around Ruatoki.[44] Once again, the men found no great differences in the oral flora between immune and susceptible individuals. They noted that with the approach of civilisation, the younger children had more caries. This time, Pickerill noted that the children's mouths were 'in all cases beautifully clean … yet their hardest food was boiled riwai or kumara, and Maori bread, with occasionally a scrap of pig or mutton.'[45]

The Otago University Officers' Training Corps

While studying for his dental degree, Hercus joined the Otago University Officers' Training Corps, a part of the Voluntary Defence Scheme.[46] He later wrote that following the Boer War:

> [T]he volunteer system was in retreat in New Zealand as it was in Britain. In an effort to increase the number of trained officers, the War Office turned to the universities for assistance and appealed for them to set up Officers' Training Corps.[47]

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[44] Ibid.

[45] Ibid., 182. This indicates a European influence as 'Maori bread' is a sourdough usually made from wheat flour.

[46] Hercus and Bell, *The Three Deans*, 201.

[47] Charles Hercus, "The O.U.M.C.," in *The first fifty years: a commentary on the development of the Royal New Zealand Army Medical Corps from inception in 1908* (Wellington: Medical Section, Army Headquarters, 1958), 15.

British Secretary for War, Richard Haldane, proposed the formation of these Corps in 1907 and the first one was established in April 1908 in Oxford.[48] ‘The hope was that it would attract young men into the army and provide an efficient system of progressive military instruction for prospective officers.’[49] Sidney Webb of the London School of Economics served on the committee set up to select a framework for these corps. Webb was a prime mover in the National Efficiency movement, aimed at improving physical fitness in the population, which was to influence Hercus greatly in later years.[50] Daily newspapers and medical journals carried articles criticising the fitness of the population and the need to improve the physique of men for military service. There was a vocal Fabian Society in Dunedin and two of the movement’s British leaders, Sidney and Beatrice Webb had visited in 1899 to promote the ideals of the Society.[51] Later, Britain’s Sir George Newman campaigned for the improvement of public health, his reports influencing Hercus as well as the New Zealand government. In Australia, the National Efficiency movement attracted the Director General of Health, J. Cumpston and other educated men, who believed that achieving efficiency was the key in many areas. The editor of Cumpston’s *Health and Disease in Australia*, M.J. Lewis interpreted ‘efficiency’ thus:

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[48] Anon. Officers Training Corps,
http://www.oua.ox.ac.uk/.../Officers %20Training%20Corps%200T.pdf

[49] Ibid.

[50] “Business Training for Soldiers,” *The Evening Post*, January 19, 1907, 13.

[51] “Dunedin Fabian Society,” *The Otago Daily Times*, June 13, 1899, 6.

> Efficiency, although not easily defined meant something like the purposeful application of expert scientific knowledge to the economic, social and political spheres of national life in order to advance the power and effectiveness of the nation in a world of competitive nation states and empires.[52]

Only one year later than the first Officers' Training Corps had been set up in Britain, the University of New Zealand set up a similar corps in Dunedin in April 1909, 'as a part of the Voluntary Defence Scheme then in force in New Zealand.'[53] There were two companies, one of which was a field ambulance, the Otago University Medical Company (OUMC) under Professor John Malcolm, and the other a combatant company under Dr P. Marshall.[54] Hercus explained the formation of the Otago University Medical Corps in 1909:

> ...[I]mmediately the South African War was ended, interest in all things military in this unmilitaristic nation declined to zero. As evidence of the general apathy to military training, an extract from Major-General Babbington's appreciation of the state of the medical services in New Zealand in 1902 is illuminative: 'At present, beyond five bearer corps, insufficiently equipped, and four ambulance

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[52] M. J. Lewis, introduction to *Health and disease in Australia*, by J.H.L. Cumpston (Canberra: AGPS Press, 1989): 4.

[53] Hercus and Bell, *The Three Deans*, 201.

[54] Charles Hercus "The O.U.M.C.," 15. Marshall was Professor of Mining at the University of Otago.

wagons, the medical resources would barely meet the requirements of a battalion.'[55]

Matters changed when Germany became more militaristic and 'in 1905 defence regulations were gazetted and established the New Zealand Medical Corps, at first as a corps of officers and later in 1908 it increased to include a field ambulance and a nursing reserve.'[56] Hercus joined the Medical Company immediately and was appointed one of the two corporals in the unit, which had 32 medical and dental students at its first parade. Eventually the numbers increased to 43 students in the infantry unit and 50 medical and dental students. The group paraded, performed physical drill, learned about military medicine and attended lectures on hygiene, sanitation and field ambulance work generally. The men were issued copies of the Royal Army Medical Corps Training book, which gave very detailed instructions on the objects of military training, which were firstly to prevent disease and secondly to give care and treatment of the sick and wounded.[57] The men also attended military camps in different locations, such as at Waitati on the Otago coast and Sutton and Matarae in Central Otago. Hercus reported Lord Kitchener's inspection of the company as a highlight in 1910.[58] Soon after Kitchener's visit, the Officers' training Corps was disbanded 'as at that time the selection of University students as future

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55 C.E. Hercus, "The Otago University Medical Corps," *Digest* 2 (1942) no.3: 10-11.

56 Ibid.

57 Anon. *Royal Army Medical Training 1911* (London, War Office, 1911).

58 C.E. Hercus, "War Memories," *Digest* 1 (1936) no.3: 16. Hercus met and spoke to Kitchener at the parade and once again on Walker's Ridge at Gallipoli when 'he came to order the evacuation.'

officers was not thought to be a democratic procedure'.[59] The unit then became B Company of the Second Field Ambulance, a backward move according to Malcolm because the training equipped the men as ordinary soldiers, not officers and the volunteer service was abandoned.[60] Over the course of his civilian career, Hercus resuscitated the OUMC twice when it appeared to be failing, because he believed the experience was valuable to students' education.

The Army based its training for its medical officers largely on sanitary hygiene for which knowledge of bacteriology was essential. This emphasis on understanding and preventing infectious diseases was likely to have been a great influence on Hercus's interest and later research in preventive medicine.

Hercus studies medicine

In 1910, Hercus graduated from the Dental School, and encouraged by Pickerill he embarked on a medical degree at the University of Otago Medical School.[61] There were close ties between the two Schools, as documented by Pickerill in 1909 in a communication with *The British Medical Journal* in which he stated that he gave 'eight lectures supplemented by practical demonstrations to senior medical students', which were well received.[62] Pickerill also carried out research using laboratory animals,

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[59] Hercus and Bell, *The Three Deans*, 202.

[60] Ibid., p.16

[61] Hercus and Bell, *The Three Deans*, 86.

[62] Pickerill, "Dental teaching for medical students," 420-1.

publishing the inconclusive results of this work in 1914.[63] These studies suffered through the small numbers of animals used, as did some of Hercus's later work, but at this time scientists commonly designed their experiments this way.[64]

Hercus began his medical degree in 1911 under Dean Professor John Halliday Scott, an Edinburgh graduate who had arrived in 1877. Hercus later credited Scott and John Malcolm, who arrived in 1905, with establishing a spirit of research that had 'extended to a greater or lesser degree according to the teaching load throughout all departments of the School.'[65] In fact, Hercus declared: 'the University of Otago was essentially a transplant from the Scottish universities and particularly the University of Edinburgh', which had a strong culture of research.[66] This culture of research was to become the model for Hercus's life-long research endeavours.

From the earliest days at the School, there were several research projects in progress, albeit in a small way, with little or no official funding and not without difficulty. The early studies were of factors of medical interest within the country's unique flora and fauna. Scott, 'an exponent of anatomy in the Scottish tradition' created an anatomy museum to contain his many exhibits, including the Maori skulls

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[63] H.P. Pickerill, "Internal secretions and dental caries with special reference to thyroid insufficiency," *BMJ* 1 (1914): 1406-7. Pickerill admitted that as only one rabbit survived a thyroidectomy, his experiments did not allow him to draw any definitive conclusions.

[64] See Chapter Four of this thesis for evidence that Hercus and other scientists experimented on very small numbers of animals and even on themselves to prove their theories about endemic goitre.

[65] Charles Hercus, "Medical Sciences," 221.

[66] Ibid., 106.

that Pickerill studied.[67] He believed that 'The skeleton was the basis on which anatomical structures were built or superimposed and osteology was the harsh discipline which confronted the medical student as he gaily or fearfully embarked upon his career.'[68] There is no evidence that Hercus took an interest in any of these research projects while he was studying, but certainly did later in his career when undertaking his own research.

Hercus graduated MB ChB in 1914 and was house surgeon at Christchurch's public hospital working with Drs H.T.D. Acland and C.T. Hand Newton 'when war came' on August 4, 1914.[69] Caught up in the euphoria of preparations for the First World War as exhibited by contemporary newspaper accounts, Hercus enlisted at the first opportunity (August 26, 1914) to serve in the New Zealand Ambulance Brigade.[70] He and Hand Newton, with whom he was to serve on Gallipoli, left with the Main Body.[71]

Hercus leaves for war service

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[67] Carmalt Jones, *Annals*, 76. Scott had begun setting up the museum not long after his arrival and in 1881, 'secured a grant of £200 for the Anatomical Museum.'

[68] Hercus and Bell, *The Three Deans*, 39.

[69] Ibid., 86.

[70] "Patriotic New Zealand," *The Press*, August 1, 1914. 'The heart of the country will thrill with enthusiasm when the public read of the scene which took place in the House of Representatives last evening' was the statement introducing the announcement that Parliament had pledged New Zealand's support for the 'Motherland' and to supply an Expeditionary Force on a 'purely voluntary basis"; D2/2023 Lt Col. Hercus, Chas, Ernest. NZDEF Archives.

[71] C.T. Hand-Newton, *A physician in peace and war* (Christchurch: N. M. Peryer Ltd., 1967), 14. 'When war came, in the army was cemented my friendship with Charles Hercus, which it has been my privilege to enjoy ever since.'

Although Hercus had gained his ‘A’ certificate from the Medical Section of the Officers’ Training Corps and had trained with the Corps under Malcolm for two years, he admitted in 1914 on joining the Mounted Field Ambulance of the New Zealand Medical Corps that he still had a lot to learn about being a Medical Officer.[72] Based in camp at the military centre at the Awapuni Race Course, near Palmerston North, he spent three months learning

> the details of the life and work of a soldier. We carried out individual and collective training in all the multifarious duties that fall to the lot of a medical officer. We spent long hours in examination of recruits and soon learnt how difficult was the correct assessment of physical efficiency for war.[73]

Now promoted to Captain, he embarked on the transport ship HMNZT No. 3 *Maunganui*, in October 1914. As a Medical Officer he gave talks to the men on physical and mental health and administered vaccines for smallpox, typhoid and cholera.[74] These early vaccines did not offer lengthy immunity and the men had to endure many repeat injections. The health measures were very unpopular with the men because they caused uncomfortable side effects, causing the men to lay low for several days at times.[75] Wellington officer W.G. Malone threatened the men in his company

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[72] Hercus, “War Memories,” 26.

[73] Ibid., 26.

[74] C.E. Hercus, “Memorial Oration: The doctor in war and peace,” *NZMJ* 56 (1955):78.

[75] W.G. Malone, *No better death: the Great War diaries and letters of William G. Malone* (Auckland: Reed, 2005), 78.

who objected to the prophylaxis with being made ‘the scavengers of the regiment and will not be taken to the front.’[76] When the next injection was due, many of these men had reneged. As a recent medical graduate with little experience of treating patients, Hercus learnt quickly how to put his military medical skills into practice with these prophylactic measures as well as gaining useful knowledge for his future career in bacteriology. He later wrote that the problems he encountered included ‘Gyppy Tummy, dysentery, sandfly fever, ennui, Nile boils, etc.’[77]

Hercus gains practical skills

Following the voyage, Hercus entered a camp in the desert close to Cairo where he trained intensively for another five months, learning how to cope with disease hazards peculiar to Egypt and the sub-tropics. Ever keen to extend his bacteriological skills, he observed researchers working on understanding the life cycle of the schistozome, Bilharzia, at the Kasr el Aini Medical School in Cairo. He also worked for some months with Colonel F.C. Batchelor, from the Otago Medical School, in trying to keep syphilis under control in the men visiting prostitutes in Cairo. He is said to have taken

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[76] Ibid., 78.

[77] Hercus to Boyd [possibly W.J. Boyd, who graduated in 1939], RNZEF Egypt, December 19, 1940 ARC-0193 94-121-51 (1940); C.E. Hercus, “Minutes of the 137th meeting of the Clinical Club, July 24, 1936,” in *The Minute Book of the 1928-1939 period of The Clinical Club of Dunedin* (Unpublished, held in the office of the Preventive Medicine Department, Otago University of Otago Medical School, 116. At this meeting, held before his communication with Boyd, Hercus elaborated on this list to include jaundice, cholera, plague and venereal disease, and noted the problems associated with ‘water supply, food, conservancy, insects and climate.’

his microscope with him to war,[78] but his skills were challenged by an encounter with a case of suspected tuberculosis at the Pont de Koubbeh Hospital in Cairo in December 1914. Using an ill-equipped laboratory, he and Private J.G. Smith, an engineer, examined a sputum sample with difficulty, neither man having done it before, but at least they had both used a microscope.[79]

These experiences with preventable diseases were important in Hercus's future career in public health. Disease prevention was paramount in wartime, with very few useful medicines available and no antibiotics. Keeping drinking water and food clean was a priority, but as Hercus observed; 'Little of our knowledge of the feeding, housing and general care of the soldier could be applied', when faced with being 'a besieged garrison' on Gallipoli.[80] Hercus had embarked for Gallipoli on 9 May 1915 where he immediately assisted in the evacuation of injured men to Malta, including his brother Arthur on September 4 1915. Hercus suffered from several bouts of gastro-enteritic illnesses during 1915 as well as severe after-effects of inoculations, according to a fellow medical officer, culminating in an enforced evacuation to the hospital ship *Maheno* in September with suspected typhoid.[81] Over the next two weeks, Hercus 'Went to Malta on the *Maheno* and worked it to stay aboard her so as to be able to come back to us again. Returned to Anzac and found us flown. [Hercus] returned to the *Maheno* and back here [to Mudros] again', recorded Captain Alex Trotter in his diary.[82]

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[78] Dow, Derek, "Hercus, Charles Ernest." In *The Dictionary of New Zealand Biography* http://www.teara.govt.nz/en/biographies/4h28/hercus-charles-ernest.

[79] D.T. Stewart, *Pathology in the wars* (Christchurch: s.n. 1994), 2.

[80] Hercus, "War Memories," 28.

[81] Alex M. Trotter, Personal Diary, held at the Cotter Medical History Trust, 70, 75.

[82] Ibid.

The medical officers performed surgery with very limited equipment but the onset of infection in the insanitary conditions on 'Anzac' often foiled their efforts.[83] 'A plague of flies reminiscent of the experiences of the Children of Israel acted as winged sponges to spread intestinal disease to all', Hercus wrote later.[84] Hercus and Hand Newton worked as a team, sharing hospital duties attending to fresh casualties. Hercus stayed on Gallipoli until the evacuation on 20 December 1915 returning to Egypt for a well-earned rest.[85]

Hercus wrote very little about his medical work on Gallipoli but 'he later acknowledged that he could never forget the sufferings he saw on the battlefields, particularly on Gallipoli.'[86] He did record attending meetings held by the Anzac Medical Society on Gallipoli and later in Egypt, demonstrating his early contribution and participation in medical research culture and dissemination of its findings.[87] A contemporary newspaper report noted:

> A band of keen, scientifically-minded medical men serving in important positions in the Gallipoli Peninsula met in the Australian Casualty Clearing

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[83] Ibid., 29.

[84] Hercus, "Memorial Oration," 79.

[85] D2/2023 Lt. Col. Hercus, Charles Ernest, NZDF Archives Trentham. Army Form B.103 Major Hercus, Charles Ernest. This states that Hercus disembarked at Alexandria on December 26, 1915, having left Gallipoli on December 20.

[86] Aesculapius, "Aequanimitas in respect of medicine," in *Christchurch Boys' High School 1881-1981* (Christchurch: The Christchurch Old Boys' Association, 1981), 280.

[87] A.D. Carbery, *New Zealand Medical Services in the Great War, 1914-1918* (Auckland: Whitcombe & Tombs, 1924), 128-9.

> Station for the purposes of establishing a medical society to be composed of medical officers of the various units in the British Army … to discuss their experiences and exchange confidences at periodical meetings.[88]

Hercus may have been one of the 100 men attending the first meeting on November 7, 1915 where they learned about the body louse and its relation to typhus.[89] The meetings shifted to Cairo after the troops withdrew from Gallipoli. In Cairo, Hercus transferred to the ANZAC Mounted Division in 1916 as Deputy Assistant Director Medical Services (DADMS) and served in Palestine, Gaza and Jordan, earning promotions and being ‘mentioned in despatches’ four times for his work. Hercus also received a DSO and OBE for his war effort.

Ridding the Jordan Valley of malaria

Hercus’s best-documented work while serving in the First World War was in preventing malaria in the troops, an administrative success on his part. The work showed his skills in acting on a scientific understanding of the disease and executing preventive measures. In Gaza in 1917, he assisted in organising regimental parties to destroy mosquito-breeding sites. Hercus most likely worked with Major E.E. Austin, a British Museum entomologist sent to help identify the mosquitoes and plasmodia. The next year, Hercus was again faced with the need to eradicate malaria-carrying mosquitoes, this time in the Jordan Valley. The troops were to spend the summer in the valley, which was ‘some 1,200 feet below sea level and notorious for heat, dust

[88] “The ANZAC Medical Association,” *The Mercury* (Hobart, Tasmania), May 3, 1916, 3.

[89] Carbery, *The Great War*, 128.

and malaria.'[90] Hercus documented this episode in the official history of the Canterbury Mounted Rifles, describing the practical means that the men used to destroy the breeding places of anopheles mosquitoes and the precautions required to prevent infection.[91] As DADMS, Hercus carried out a survey of the valley for mosquitoes, inspected and controlled the anti-mosquito measures taken by the more than one thousand men. He helped set up diagnostic units to determine if men reporting sick were carrying the malarial parasite. Positive cases were sent to Jericho where there was a mobile laboratory. 'We trained the technicians in the recognition of the malarial parasites,' reported Hercus, 'and in the binomics of the anopheles.'[92] In addition to this diagnostic survey, Hercus assisted in a study of malaria in the local population by 'carrying out a splenic survey of all the children under 12 in the native population.'[93] An enlarged spleen was an 'almost definite evidence of malarial infection,' according to current thinking, and 60 percent of the children were affected.[94] In 1940, Hercus modestly attributed the success of the 1918 offensive against malaria to 'the high standard of intelligence and discipline of the troops rather than to any novel means of control. Our principal weapon was education and effective co-operation of all ranks.'[95]

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[90] Hercus, "Memorial Oration," 80.

[91] Officers of the Regiment, *The history of the Canterbury Mounted Rifles 1914-1919*, ed. Col. C.G. Powles (Christchurch: Whitcombe & Tombs, 1928), 239-42.

[92] Hercus to Kenneth McCormick, December 17, 1940, ARC-0193 94-121/51 (1940).

[93] Ibid.

[94] A.G. Butler, *The official history of the Australian Army Medical Services, 1914-18, Vol.1* (Melbourne: Australian War Memorial, 1938-43), 707.

[95] Ibid.

Hercus later summed up his war experiences as a ‘five-year postgraduate course’ in the field. Of great assistance was ‘the emphasis in the Royal Army Medical Corps handbook [which] was fundamentally correct and applicable to a large extent to civilian life.’[96] During the war, he had gained experience in practical bacteriology and care of patients infected with dysentery, cholera, typhoid, diphtheria, typhus or smallpox, but the most interesting to him was bilharzia, an infection caught by a considerable number of the Australian troops.[97] Hercus helped prevent these infections by instilling good sanitary measures in the men. Major-General Chaytor commented on Hercus’s great organising ability and efficiency as well as foresight in preventing malaria and helping evacuating 12,000 malarial casualties in the final stages of the Palestine campaign, ‘without a break down.’[98] In addition to helping prevent infectious diseases, Hercus also believed that maintaining mental health in war and peace was immensely important and that ‘we had learnt for all time the value of liaison.’[99]

A very important aspect of Hercus’s war effort was that he came to know many medical men who later held important positions in medicine in Australia, Britain and New Zealand. These included Australians Dr Harvey Sutton (Chair of the ANZAC Medical Association in 1916), Sir Thomas Dunhill and Sir George Adlington Syme, as well as Dr Dudley W. Carmalt Jones, who was later to become a colleague at the

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[96] Ibid., 80.

[97] Butler, *Australian Army*, 605.

[98] Major-General Chaytor, “Hercus testimonial,” February 2, 1922, D2/2023 Lt Col. Hercus, Chas Ernest, NZDEF Archives, Trentham.

[99] Hercus, “Memorial Oration,” 79.

Otago Medical School. Many of these contacts would prove critical to the later development of Hercus's research programmes in New Zealand. He would later exhibit similar networking skills amongst scientists within New Zealand in his own research into endemic goitre.

For all he had learnt at war, Hercus felt 'ill equipped for entering general practice.'[100] His experiences were mostly in administration and managing sanitary conditions for the troops. He decided that his future lay in public health and in January 1919, the army granted him three months' study leave to investigate public health courses at the University of Edinburgh. He and two other officers ultimately made the journey in August 1919.[101] Although he felt he had been losing touch with general medicine, he was able to read the *British Medical Journal* while serving with the army. While waiting for permission to travel, Hercus wrote a letter to the journal in support of Australian soldiers, whom he believed a reviewer had maligned in a book review published in January.[102] The author claimed that Australian troops did not follow the strict discipline followed by British troops in camp. Hercus felt that minor class-ridden, traditional habits such as saluting, were foreign to Australian troops and were neither important nor should be expected. 'Fighting is the only real test of the presence of discipline,' he said.[103]

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[100] Hercus to Director General Medical Services, Wellington, January 14, 1920. D2/2023 Lt Col. Hercus, Chas Ernest, NZDEF Archives, Trentham.

[101] Health, welfare, etc., Colonel R.H. Walton and Colonel C.E. Hercus NZMC [New Zealand Medical Corps] January-November 1919. ACID 17590 WA1 Box 1/3/23 10/54 (R21969525), Archives New Zealand.

[102] Hercus, "The A.A.M.C. in Egypt," 429-30.

[103] Ibid.

The *British Medical Journal* in 1919 also carried Allbutt's rousing address in which he congratulated the returning troops for their successes in preventing deaths through infection 'owing to scientific prophylaxis,' and inspiring medical research to 'wrest new secrets from nature' and to turn 'medicine from an observational and empirical craft into a scientific calling.' He emphasised the importance of working with other scientific disciplines, which were also making great advances after the war, such as physics, biology, nutrition and statistics.[104]

By war's end, Hercus was well aware of the general lack of understanding of bacteriology – how (and which) bacteria, viruses and other microscopic organisms caused disease – and the virtual absence of treatments or cures. He had seen for himself the effects of malarial parasites on the troops as well as some of the tropical diseases rife in the Middle East. He returned to New Zealand on December 26, 1919.

> Hercus brought with him four years of practical war experience in Gallipoli and Palestine and the conviction that much of the knowledge and spirit of preventive medicine applied in the Palestine campaign could be used with advantage in the day-to-day work of the general practitioner.[105]

In 1957, Colonel Ferris Fuller in giving the Graduation Address for the Faculties of Medicine and Dentistry told the students how fortunate his student contemporaries had been in experiencing the atmosphere that Hercus had brought to the School following

[104] Ibid.

[105] Hercus and Bell, *The Three Deans*, 259.

his war service.[106] Hercus 'had fought preventable disease with success and fame in the tented camps of Sinai whilst a young officer of the New Zealand Medical Corps in World War I,' Fuller claimed, creating an atmosphere that 'prepared [the students] better than they realised for this age of preventive medicine and hygiene.' The work 'was in keeping with the high example of Pasteur, Bentham, Chadwick, Ronald Ross and others.' Fuller proposed that Hercus's experience in wartime was 'perhaps the start of a distinguished research and teaching career in this branch of medicine.'

By the beginning of 1920, Hercus was ready to begin a Diploma in Public Health (DPH) at the School, a course that Champtaloup had established in 1913. This was the first university diploma recognised in New Zealand. It was a niche course for medical practitioners, which few had undertaken by the time Hercus enrolled.

Conclusion

The intervention of the First World War into Hercus's career in medicine was to have long-ranging effects, both in his choice to pursue the study of public health and preventive medicine, as well as in his almost life-long association with the New Zealand Army. Serving in the war allowed Hercus to become a highly motivated and efficient military medical officer. He began to build up a network of influential men while on military service who would be of great assistance to him in carrying out his research in later years. These men included Malcolm, (through the OUMC), Hand Newton (who would later assist Hercus in getting funding for research), Australians Sutton and Syme, and later School colleague, Carmalt Jones.

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[106] J. Ferris Fuller, Director of Dental Services NZ Armed Forces, "Graduation address, Faculties of Medicine and Dentistry, University of Otago, December 12, 1957," *NZMJ* 57 (1958): 1-7.

Hercus gained much practical experience in preventive medicine during the war that he could bring to his new role at the School. In addition to looking after the health of the troops, he was able to carry out some research into the incidence of malaria in Jordanian school children, and learn some practical skills in preventing tropical diseases. He could later share this expertise with his former students serving in the Second World War.

At the beginning of 1920, Hercus was set to enter a career in public health, having had a brief introduction to the subject in Edinburgh and coming under the influence of Sir George Newman and earlier by the National Efficiency movement. Hercus returned to New Zealand with a new knowledge of bacteriology, the limitations of the available vaccines and the importance of sanitary skills in their prevention. He had already shown an interest in medical research while on military service – albeit into a disease not usually found in New Zealand (malaria), and helped in a medical survey. Even before this work, he had written his first scientific paper, as a dental student in 1910.

Chapter Two: Hercus and the origins of scientific and medical research in New Zealand

Public health was [Hercus's] real interest.—Anon., 1971[1]

Hercus closely aligned himself with Sir George Newman, Chief Medical Officer for the Ministry of Health in England 1919-35.—Warwick Brunton, 2012[2]

Introduction

In late 1919 when Hercus returned to New Zealand, the country was experiencing the lingering effects of the 1918 influenza pandemic in addition to the loss of young men who had served in the war. In the coming decade there was to be 'a noticeable improvement in the comfort of urban life during the 1920s that owed something to the epidemic and what it revealed.'[3] An emphasis on the sanctity of life increased attention on preserving the lives of the child and mother and the first children's health camp had just taken place.[4] 'Family life was exalted by a cult of domesticity' and 'conformity, order and regimentation was certainly the name of the game during the inter-war years' in New Zealand.[5]

The Department of Public Health had been criticised for its response to the influenza pandemic and plans were underway for its reform. The department had

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[1] Anon., "Obituary: Sir Charles Hercus," *NZMJ* 70 (1971): 232.

[2] Brunton, *Medicine of the future*, 65.

[3] Tom Brooking and Paul Enright, *Milestones: turning points in New Zealand history* (Lower Hutt: Mills, 1988), 143.

[4] Tennant, "Children's Health Camps", 75.

[5] Wright, *Illustrated history of New Zealand*, 284-5.

been understaffed and 'even in normal times [it] simply lacked the staff to deal with a public health emergency on such an unprecedented scale.'[6] People lacked basic knowledge on hygiene and how infection spread, city housing and sewerage needed improvement. There was an increased interest in town planning and urban renewal.[7]

Having taken steps to investigate a career in public health before returning to New Zealand in 1919, Hercus took a job at the Department of Public Health as a Junior Medical Health Officer in Christchurch. The following year the government passed the 1920 Health Act, dividing the new Department of Health into five Divisions and increasing staff numbers, though initially the department could not 'obtain the necessary staff to carry out the various duties imposed … by the Health Act.'[8] By taking this position, Hercus was able to study for a Diploma in Public Health (DPH) over the following nine months before moving to Dunedin at the beginning of 1921. Hercus soon took over some of the bacteriology and public health lectures at the School for the ailing Professor Sydney Champtaloup, eventually replacing him in 1922. During this period, he began what was to be a twenty-year study into endemic goitre carried out in close association with the Department of Health.

As in post-war Britain, New Zealand faced new challenges in the area of scientific research that in New Zealand had previously concentrated on understanding the natural environment. The National Efficiency movement

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[6] Rice, "1920 Health Act," 12.

[7] Brooking and Enright, *Milestones*, 143.

[8] Annual Report of the Director-General of Health, *AJHR* 1920-21, H-31, 2.

increased interest in the promotion of public health in both countries. Medical research, which until then had been the almost exclusive preserve of the Otago Medical School, had gained little government support.

Despite having decided not to further his career in dentistry by taking up study for a medical degree, Hercus did use his dental skills, albeit very briefly, and then to fulfil an unmet need of a group of Maori he encountered in the mid-1920s. He had travelled into remote areas prepared to examine the purportedly perfect teeth of the Maori. He was disappointed to see the influence a Western diet had had on their teeth that had occurred since his two former lecturers, Champtaloup and Pickerill had visited. Hercus was interested in more than seeing sets of perfect teeth – he was also keen to observe the incidence of simple goitre in the land-locked populations of Maori in the Urewera Country. The visit was curtailed by an outbreak of typhoid that Hercus managed with military efficiency but not before he had collected anthropological data on the Maori.

The aftermath of war and settling into a new career

Hercus returned to civilian life having learnt practical administrative skills in dealing with disease prevention among large groups of men. At this time, as a result of the war, bacteriology and epidemiology were beginning to show promise in the understanding of infectious disease. Commentators predicted that discoveries made during the war would transform medicine into a more scientific discipline.[9] The war

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[9] Anne Hardy, *Health and Medicine in Britain since 1860* (Basingstoke: Palgrave, 2001), 47. Following the First World War, medical discoveries made during the war seemed very important, but historians now question whether these were of much use later to the general population.

would inspire new research into public health. In 1915, J.H.L. Cumpston, who would become Australia's first director of public health in 1921, claimed that:

> The stirring of a nation's soul under a common danger is one of the most wonderful effects of the war, and is, I firmly believe, destined to be one of the most profound and far-reaching effects of the war upon the public health. … [Returning troops would have the war-taught knowledge that] … things can be accomplished by resolute men, activated by a common impulse, and determined to achieve any objective which represents an advantage on their previous position.[10]

In fact, military doctors had already learned from the Boer War many of the important lessons such as, immunisation against typhoid and smallpox, as well as using tetanus anti-toxin and antiseptics for wounds.[11] The emphasis in the British Army in the First World War was on maintaining good hygiene to prevent disease. Hardy claims that 'While many of the effective treatments for the sick, injured and wounded were worked out during the course of the war, the prevention of infectious disease depended crucially on medical research carried out in the two decades immediately preceding it.'[12]

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[10] John Powles, "Professional hygienists and the health of the nation," in *The Commonwealth of science: ANZAAS and the scientific enterprise in Australasia 1888-1988,* ed. Roy MacLeod (Melbourne: Oxford University Press, 1988), 298.

[11] Hardy, *Health and Medicine*, 48-9.

[12] Ibid., 60.

Hercus had already trained in military sanitation methods during his time with the OUMC and instructed the troops in camp and on board the transport ships on sanitary matters. This training saved lives, as for the first time in history, more men died of wounds than died of disease during the war.[13] An alarming lesson learnt from the war, however, was the apparent ill health of so many men in the prime of their lives. Large numbers of recruits did not pass medical inspection in Britain, Australia and New Zealand. Analysts now believe that failing so many recruits for service was not a good indicator of the health of the country's manhood, or at least in Britain where 'The hurried examinations of up to 200 men per day per doctor probably underestimated the true extent of disability and illness in the working population.'[14] The examiners received one shilling per recruit passed and nothing for those they failed, and considered only men aged 18-30 years.[15] In reality, the examiners judged the men on their ability to bear arms. Thus, it was not a scientific survey of the health of the men and it was coloured by eugenic concepts that had arisen following examination of British recruits at the time of the Boer War in 1899. Did the poor state of health of these men indicate progressive racial degeneracy, or did 'dirt, neglect and ignorance' cause their sorry condition?'[16] An unhealthy citizenry meant not only declining

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[13] Ibid., 59.

[14] J. M. Winter, "Military fitness and civilian health in Britain during the First World War," *Journal of Contemporary History* 15 (1980): 214.

[15] Ibid., 215.

[16] Bentley B. Gilbert, "Health and politics: the British Physical Deterioration report of 1904," *Bulletin of the History of Medicine,* 39 (1965) 144.

national power and compared unfavourably with 'an armed, vigorous and populous German Empire' [and] National Efficiency became the topic of the day.[17]

In New Zealand the government, shocked by the poor state of health of would-be recruits set up a National Efficiency Board in 1917 under the chairmanship of William Ferguson, a Wellington engineer (brother of Sir Lindo Ferguson, Dean of the School). The Board's duties were to advise government on industries, occupations, labour and national efficiency, including pub licensing. The Board ceased to operate after 1920. The country's interest in National Efficiency remained and Hercus was to champion the cause with his research and influence. Hercus was interested in the eugenics movement, whose chief proponent in Dunedin in Hercus's student days was Sir William Blaxland Benham, Professor of Biology and Curator of Otago Museum.[18] Benham advocated for the study of eugenics and instigated the formation of a branch of the organisation in Dunedin in 1910. Benham and Hercus were to become colleagues in the School and both belonged to the Otago Branch of the New Zealand Institute (later the Royal Society) and to the exclusive Dunedin Club.[19] Hercus later advocated for the quantitative if not qualitative ideals of eugenics when the country appeared to be heading for population decline in 1940 in his *Wilding Memorial Lecture.*[20]

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[17] Ibid.

[18] David Miller, "Sir William Blaxland Benham, K.B.E., F.R.S. (1860-1950)," *Transactions and Proceedings of the Royal Society of New Zealand* 80 (1952): 103-12.

[19] Gordon Parry, *Tradition and change*: *the first 150 years of the Dunedin Club* (Dunedin: Dunedin Club, 2008): 44-5, 81 and 85.

[20] Hercus, *Wilding Memorial Lecture*, 6-12.

Assistant District Health Officer

On his return to New Zealand, Hercus approached the Defence Department in mid-January 1920, hoping for a part-time position that would leave him time to study for his DPH.[21] There were no suitable positions available, possibly because the Defence Department had been appointing 'recently qualified medical men' to positions in military institutions, releasing the more highly paid medical officers.[22] Perhaps reluctantly, Hercus took a position as Assistant District Health Officer just a few weeks later with the Department of Health in Christchurch on February 5, 1920.[23] His appointment was simply recorded in *The Press* at the bottom of a column reporting influenza statistics, but when it appeared a few days later in the Personal column of *The Auckland Star*, he was cited as 'Lieut-Colonel C.E. Hercus, D.S.O., NZMC' who had been demobilised and taken up duty in Christchurch as 'Assistant Public Health Officer for Canterbury-Westland district.'[24] This was a more flattering report for Hercus while at the same time it informed the public perhaps of the calibre of the men that the Department was recruiting at a time when the Department was unable to 'fulfil its obligations to the local authorities as regards the appointment of Sanitary Inspectors.'[25]

In each of the four main centres, the government had created positions for two Health Officers as part of the reorganisation of the Department in 1919-20. By taking

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[21] Charles E. Hercus to Director-General Medical Services, January 14, 1920. D2/2023 Lt Col. Hercus, Chas Ernest, NZDEF Archives, Trentham.

[22] General Officer's address, Defence Forces of New Zealand, *AJHR* 1921, H-19, 17.

[23] "Influenza," *The Press*, February 6, 1920, 7.

[24] "Personal," *The Auckland Star*, February 11, 1920, 4.

[25] Annual Report of the Director-General of Health, *AJHR* 1920-21, H-31, 2.

this position, Hercus was able to undertake his DPH, for which, in addition to other study, he had to serve in a District Health Office for three months.[26] His swift employment may have been partly due to the Department's recent loss of staff to influenza and to his exceptional war record in disease prevention and administrative abilities.

In Christchurch, the Department of Public Health and the Department of Education were located in the Government Building in Cathedral Square.[27] This was fortuitous for Hercus as he was to work closely with Dr Eleanor Baker, a School Medical Officer employed by the Department of Education. At this time all the School Medical Officers were women, a fact that Tennant claims was because the military needed all the male doctors it could get during wartime and because it was difficult for women to set up in private practice in a male-dominated profession, leaving women doctors few choices for employment.[28] Often, children's parents treated the Officers with suspicion: 'Mothers regarded the school doctors as potential critics of their maternal capacities; children feared the threat of tonsillectomy and removal to

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[26] Brunton, *Medicine of the future,* 48.

[27] Eleanor S. Baker-McLaglan, *Stethoscope and Saddlebags* (Auckland: Collins, 1965), 124. The Service tried to see once a year all new entrants, all school leavers in Standard 6, all Standard 2 pupils, and all applicants for admission to Teachers' Training College in addition to selected children of concern.

[28] Margaret Tennant, "Missionaries of health; the School Medical Service during the inter-war period," in *A healthy country; essays on the social history of medicine in New Zealand*, ed. Linda Bryder (Wellington: Bridget Williams, 1991), 130-31.

health camp.'[29] In the Wanganui area, children were terrified at the prospect of School Medical Officer Dr Elizabeth Gunn's attentions, reportedly running home if they saw her coming.[30] In 1920, the officers found that the health of the country's children was poor, with an average of 79 percent of the children in the schools examined suffering from physical or mental defects of some kind in 1920.[31] The officers' job was to educate the children to use healthy practices by producing 'educative propaganda with a view to the prevention of disease providing them with leaflets on topics such as teeth, adenoids and enlarged tonsils and defective vision', as well as writing newspaper articles.[32]

Hercus had arrived back in Christchurch to continuing outbreaks of influenza and a changing of officers at the local Health Department office.[33] Former Chief Health Officer, Dr Herbert Chesson, had resigned to take up a position in Samoa, but stayed on to assist the new Medical Officer of Health, Dr Telford cope with the April outbreak.[34] Daily reports of new cases in Canterbury and the West Coast appeared in *The Press* until February 9, reducing to twice weekly after that as the outbreak was

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[29] Margaret D. Maxwell, *Women doctors in New Zealand 1921-1986* (Auckland: IMS NZ Ltd., 1990), 119.

[30] Anon, "Obituary, Elizabeth Catherine Gunn," *NZMJ* 63 (1964): 109.

[31] Annnual Report of the Director-General of Health, *AJHR* 1920-21, H-31, 25.

[32] Margaret Tennant, "Missionaries of health," 128-48.

[33] See Geoffrey Rice's *Black November: the 1918 influenza pandemic in New Zealand* (Christchurch, Canterbury University Press, 2005) for a comprehensive investigation into the influenza epidemic.

[34] "Dr Chesson's advice," *The Ashburton Guardian*, April 22, 1920, 5.

slowing.[35] There was no cure for influenza or knowledge of the causative microorganism – the only advice that medical men could give was for citizens to avoid crowding and to gargle with Condy's Fluid or a solution of salt and borax.[36] St. Bartholomew's Sir Thomas Horder wrote in a lecture to the BMA in November 1919 that the most important thing by far was a free current of fresh air, and that the available vaccines might prevent secondary infections of the lungs.[37] *The Press* quoted part of this lecture the same day as Hercus began his new job, as evidence that there was indeed some use for the free vaccination being offered in New Zealand for influenza. The public was slow to take up the offer, however.[38]

In the short period that Hercus stayed in Christchurch, he became increasingly involved in public health. He acted as part-time Medical Officer in the Bacteriology Department at Christchurch Hospital, as Acting-District Health Officer advising on the influenza epidemic in Runanga, and giving advice on drainage matters in Addington, according to local newspapers.[39] This was in addition to fulfilling requirements for his DPH and the goitre studies he was working on with Baker. In retrospect, this apparently frenetic pattern of his work was absolutely typical of his later work as Dean of the Medical School.

The state of scientific research in New Zealand after the First World War

[35] "Influenza: mild cases slightly increase," *The Press*, February 9, 1920, 6.

[36] "Dr Chesson's advice," *The Ashburton Guardian*, April 22, 1920, 5.

[37] Thomas Horder, "Preventive treatment in influenza," *BMJ* 2 (1919):695-8.

[38] "Influenza," *The Press*, February 6, 1920, 7.

[39] "Personal items," *The Press*, February 6, 1920; "Influenza: the Runanga outbreak," *The Press*, March 4, 1920, 6; "Borough Council: Riccarton," *The Press*, November 24, 1920, 8.

From as early as 1884, Dunedin North's Member of Parliament, George Malcolm Thomson suggested that 'the government set up one department to administer science.'[40] By 1919, politicians were still unable to agree on setting up such a department to foster research and did not include medical research in their debates.[41] Thomson, by now a Member of the Legislative Chamber, tirelessly advocated for setting scientific research on a better basis and for New Zealand to be first in the Empire to have a Department of Scientific Affairs.[42] To an unreceptive audience in the Legislative Chamber he explained that he was not trying to increase the number of government departments as some suggested, but to arrange the science-orientated ones in a coherent way. New Zealand could lead the way in having a 'Scientific Department.'

In fact, Britain had already established a DSIR in 1916 as a response to 'the awakening of Great Britain to the need for scientific research for national well-being.' The war had revealed the commanding position of Germany in the application of science to industry. Parliamentarians seemed to misunderstand Thomson's pleas accusing him of trying to establish yet another government department, not amalgamating several with similar roles. Thomson withdrew his motion to create a scientific department regretting the lack of support for scientists, their low wages, and waste of talent when they departed for work in other countries, because of this disorganisation in New Zealand. Despite the increasing awareness of the need to

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[40] Michael E. Hoare, "Beyond the filial piety," Second Cook Lecture 1976 (Melbourne: The Hawthorn Press, 1977), 28.

[41] "Department of Scientific Affairs," *NZPD*, October 15, 1919: 382-9.

[42] Hoare, "The Board of Science and Art 1913-1940," 26.

increase medical research to improve public health, the New Zealand parliament did not include the topic in these debates.

Despite having little or no government support, scientists had begun to carry out research in New Zealand soon after settlement of the country, studying the fauna and flora as well as its geology, and the potential for resource mining.[43] They also studied the soils and the health of introduced livestock, through the Department of Agriculture that had been set up in 1892. Scientists published the results of their endeavours in the journals of the New Zealand Institute, the Department of Agriculture, the New Zealand Branch of the British Medical Association (*The New Zealand Medical Journal*) or in *The New Zealand Journal of Science and Technology*, established by the Board of Health in 1918, as mentioned in the Introduction to this thesis. There were few professional scientists in New Zealand.

In his Introduction to a symposium of New Zealand scientists in 1957, I.D. Dick noted that in the 1920s in this country

> [I]f you were reasonably friendly, you had no trouble getting to know all your colleagues personally for they numbered, all told, not more than a hundred … . Almost all of the research was confined to geology, natural history and systematics, almost all of which was directed towards problems in agriculture.[44]

The New Zealand Institute provided some funding for this work, but realistically it was only for amateur research. Not a lot of this funding came to the School, except for

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[43] Ibid., 14-15.

[44] Dick, "Historical introduction to New Zealand science," 16.

Professor John Malcolm's long-running nutritional studies into the food value of New Zealand fish, and the biochemistry of fish and mutton-bird oils.[45] Malcolm also offered expert advice 'on matters concerning scientific research in New Zealand, particularly as it affected nutrition and biochemistry.'[46] He had a series of assistants including Michael Watt (1911-15), later to become Director-General of Health. Malcolm's published research on the nutritional values of different fish species would not appear to be of immediate use to improving the health of New Zealanders who reportedly ate very little fish in their diet. Nevertheless, the New Zealand Institute felt the work was important and funded it for more than a decade.

The lack of any organised approach to medical research persisted, as did the problem of how to improve the unfitness in military recruits exposed during the war. Perhaps introducing regular health checks would help. In 1920, Member of Parliament Col. Collins introduced a motion to Parliament to examine the population for preventable disease on a yearly basis. He claimed that this would lessen morbidity and mortality in:

> tuberculosis, cancer, diabetes, heart-disease, apoplexy, kidney diseases, mental diseases especially general paralysis, which should never be seen; diseases of

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[45] C.E. Hercus, "New Zealand and Medical Research," Second Hudson Lecture, *New Zealand Science Review* 8 (1950): 108. From 1918-26, Malcolm received £630 for research.

[46] Hercus and Bell, *The Three Deans*, 234. As Malcolm was directly involved with the OUMC he was a close associate of Hercus and both were members of the exclusive Clinical Club.

the nervous system, especially that very prolonged and painful disease, locomotor ataxia. [47]

Without a research effort to understand and treat these conditions, the plan was unlikely to succeed. What was needed was to follow the lead of the British Government which was working to establish and fund a Medical Research Council (and began in 1921), a body that had begun as a Committee of the Department of Health several years before.[48] Any plans to replicate the British MRC structure in New Zealand would have to wait. The country was struggling with a high cost of living and substantial war debt in 1920. It needed thrift from its people and there was little money available for research.

By 1920, in common with other Commonwealth countries, in addition to managing the lingering effects of the influenza pandemic, New Zealand was coping with other infectious diseases, shortages of commodities, shortage of labour and a poor record of physical fitness in men rejected as recruits by the Defence Force. New Zealand also had an astonishing number of people with endemic goitre. In his Annual Report for 1920, the Director-General of Health, T.H.A. Valintine regretted the difficulty in finding suitable staff and the lack of scientific knowledge about infectious diseases:‘

We know no more of the causes of diphtheria than was known 30 years ago. The same can be said of influenza, measles, whooping-cough etc. Our only hope

[47] "Welfare of the people," *NZPD*, September 22, 1920, 1115.

[48] Hercus, "Second Hudson Lecture," 107.

as regards diphtheria is action based on the Schick reaction and toxin-anti-toxin immunization.[49]

To solve these problems would require scientific research, or more specifically, medical research, defined by Hercus as dealing 'with the proper development and the right use of the human body in all conditions of activity and environment as well as with its protection from disease and accident and its repair.'[50] He believed that 'there could be few branches of science that did not contribute to medical research,' and demonstrated this in his many experiments to investigate the causes of New Zealand's goitre problems related in Chapter Four of this thesis. The government in the 1920s offered little support for such ventures.

The reason that medical research did not feature in the discussions to reorganise scientific research in 1919 may have been that there was very little of it being done and most of it within the School, and thus not readily accessible to the public. Parliamentarians may not have seen such studies as being immediately useful to the country or the health of its citizens, in contrast with agricultural research, which aided the production and export of farm produce. Medical research underway at the School before 1919 included investigations by Malcolm and Dr Frank Fitchett of the plant toxin tutin for its pharmacological effects on farm stock,

[49] Annual Report of the Director-General of Health, *AJHR* 1921-22, H-31, 2.

[50] Hercus, "Second Hudson Lecture," 105.

cats, dogs, chickens and rabbits.[51] Although interesting, this work would not have added much useful knowledge to the public, which already knew that tutu plants were toxic. Scott's osteology studies of the Maori mentioned in Chapter One of this thesis were likely to have been of academic interest only to parliamentarians considering whether to fund scientific research.

Early surveys of the incidence of endemic goitre had been carried out by two doctors, Christchurch's Dr Hacon and Otago University's Dr Daniel Colquhoun, who both had been struck by the large numbers of people with the condition after as few as thirty years from settlement of the country.[52] They questioned physicians throughout New Zealand to ascertain the numbers of cases and look for possible causes. Much of this work was underway when Hercus was still a student but no one in New Zealand had made an attempt at widespread iodine prophylaxis experiments for endemic goitre in the interim, despite the fact that scientists had reported successful experiments in America and Switzerland. With the appointments of Champtaloup and Murray Drennan between 1910 and 1915,

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[51] Frank Fitchett and John Malcolm, "On the physiological action of tutin," *Proceedings of the University of Otago Medical School,* 1 (1922), unpaginated. Tutin is a picrotoxin-like toxin found in several Coriaria species, the 'tutu' plant.

[52] Dr Hacon, "Endemic disease of New Zealand – goitre endemic on the Canterbury Plains, about Christchurch," *NZMJ* 2 (1888): 244. Hacon's observations were coloured by current thinking on illnesses being cause by miasmas. He was medical superintendent at Sunnyside Hospital where many inmates suffered from goitre. His plan was to lower the subsoil water and lay concrete under all houses to reduce the incidence of goitre. ; Daniel Colquhoun, "On goitre," *NZMJ* 8 (1910): 17-71.[52] Hercus and Bell, *The Three Deans,* 177.

medical research expanded into public health issues such as tuberculosis and thyroid diseases.[53]

Even though the School's medical researchers reported some health messages to the public via newspapers and lectures, they published their work predominantly in the *New Zealand Medical Journal* or in other medical publications inaccessible to the public, such as in *The Proceedings* and in international biochemistry and physiology journals.[54] *The Proceedings*, limited to 100 copies, consisted of papers published by staff of the School in other journals such as the *Journal of Anatomy*, *Journal of Hygiene*, and the Medical Journals of Australia, New Zealand and Britain. The Dean's files for 1922 include letters of thanks for copies from Birmingham University, St Thomas's Hospital, The Royal College of Surgeons, the University of Michigan and the School of Medicine in Cairo.[55] Prior to 1951, the papers were often interesting case studies but themes developed, with thyroid, goitre and hydatid disease research dominating many issues.

Comparing research in New Zealand and Australian Medical Schools

Although the output of medical research from the Medical School by 1920 was not great, it exceeded that in equivalent Australian Schools. The medical schools at

[54] Carmalt Jones, *Annals*, 187. Carmalt Jones began the publication of *The Proceedings* as editor in 1922. It consisted of papers published by staff of the School in other journals such as the *Journal of Anatomy*, *Journal of Hygiene*, and the Medical Journals of Australia, New Zealand and Britain. It was limited to 100 copies. The papers were often interesting case studies but themes developed, with thyroid, goitre and hydatid disease research dominating many issues.

[55] ARC-0913 94-121-8, 1922.

Melbourne, Adelaide and Sydney were predominantly centres for vocational instruction and only rarely carried out research, but several research institutes did.[56] As in New Zealand, researchers focused on understanding the properties of unique fauna and flora, which in Australia included tropical diseases and venomous bites inflicted by the indigenous fauna. At the *Walter and Eliza Hall Institute of Research in Pathology and Medicine* attached to the Melbourne Hospital (1919) researchers focused on respiratory disease, amoebic and bacillary dysentery, and hydatid disease in the early years.

Hobbins suggested a lack of a tradition of medical research in medical schools in Australia was because they lacked a research culture.[57] As explained earlier this was not the case in New Zealand. Almost immediately the University of Otago established the Medical Faculty, research commenced, though it was not without difficulty. Scott had to contend with 'a complete absence of assistance either professional or technical,' in his Maori studies.[58] Malcolm, coming later, fared somewhat better with monetary support from the New Zealand Institute but faced an ever-changing succession of assistants.[59]

After the First World War, scientific research in Australia was changing emphasis, from creating fundamental knowledge to solving pressing problems in pursuit of national efficiencies.[60] In New Zealand, there was much agonising over the lack of

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[56] Peter Graeme Hobbins, "Outside the institute there is a desert: the tenuous trajectories of medical research in interwar Australia," *Medical History* 54 (2010): 6.

[57] Ibid., 5.

[58] Hercus and Bell, *The Three Deans*, 177.

[59] Ibid., 233.

[60] Hobbins, "Outside the institute," 3-6.

fitness of recruits for the military, extending for years afterwards. The country was struggling with a high cost of living and substantial war debt in 1920. The people needed to exercise thrift and there was little money available for research. There were no pathways for budding researchers to follow in Australia or New Zealand and neither were there were any opportunities open.

Nine months after Hercus took up his position as Medical Officer in Christchurch the parliament passed the 1920 Health Act. Embodied in the Act was a name change from the 'Department of Public Health, Hospitals and Charitable Aid' to the 'Department of Health.' It also included a clause expecting that Health Officers would 'promote or carry out researches and investigations in relation to matters concerning the public health, and the prevention or treatment of disease.'[61] Public criticism of the Department over the handling of the 1918 pandemic inspired the restructuring of the Department, which now had seven divisions, including the School Hygiene Division, formerly the preserve of the Education Department.[62] Perhaps medical research would now expand within the Department as medical officers became aware of the much-publicised public health work of Britain's Sir George Newman. Hercus was a great admirer of Newman's work.

Sir George Newman's influence on New Zealand public health

Newman, Britain's first Director General of Health was very much in favour of inspecting schoolchildren to prevent illness, a practice that Hercus also adopted in

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[61] Public Health Act 1920, Part 1, Section 12, 1066, New Zealand Statutes.

[62] Baker-McLaglan, *Stethoscope and Saddlebags*, 124.

his goitre studies.[63] By 1920, New Zealanders could read Newman's comments in their daily newspapers on the 'impaired physique' of the British people, the high rejection rate of wartime recruits, and that 'one million children of school age were so defective as to be unable to reasonably benefit from their schooling.'[64]

Brunton reports that Hercus kept a copy of Newman's Memorandum, *An outline of the practice of preventive medicine*, and 'heavily annotated inspirational portions.'[65] Newman published his *Memorandum* in 1919, sometime before October when a review appeared in *The British Medical Journal*.[66] Hercus may have got his copy while he was on leave from Egypt at Edinburgh between August and late October of 1919.

As originator and promoter of much of Britain's policy on public health, Newman had great influence on New Zealand's health policies. His *Memorandum*, reprinted in 1926 due to popular demand, emphasised the need to 'develop and fortify the physique of the individual and thus increase the capacity and powers of resistance of the individual and the community.'[67] Newman insisted that the purpose of preventive medicine was 'the removal of disease and physical inefficiency combined with the husbanding of the physical resources of the individual.' Preventive medicine should not be confined to sanitation, but must pervade all branches of medicine. Newman believed synthesis and integration in medicine was necessary and ranked the areas of

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[63] Newman, *Outline of preventive medicine*, 68-71.

[64] "The National Health," *The Grey River Argus*, June 29, 1920, 2.

[65] Brunton, *Medicine of the future,* 65-6.

[66] Ibid.; Anon., "The preventive medicine of the future," 502-3. The memorandum was quickly out of print but republished in 1926 with new material added.

[67] Newman, *Outline of preventive medicine*, 10.

importance, putting medical research last on the list.[68] Heredity and race were of prime importance he said and there could be progress only if alcoholism, the incidence of syphilis and feeble-mindedness and degenerative processes caused by lead poisoning and tuberculosis were reduced. Commentators considered Newman's allusion to eugenics as 'bold' but these ideas were not unusual at the time: Allbutt referred to heredity and disease in his address to the British Medical Association in 1919.[69]

Although Newman's opinions were well publicised in New Zealand newspapers and in *The British Medical Journal*, it is interesting to see that Allbutt had addressed the British Medical Association in London in April 1919 with a very similar advocacy for preventing disease.[70] Allbutt claimed that:

> Medicine has come to a new birth, and in this generation has fought on no unequal terms with other arms in a glorious campaign. … It might be supposed that in war there would not be time to think, only to do; but we are surprised to receive enormous gifts to medical science from the great caravan of our returning pilgrims.[71]

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[68] Ibid., 131. The full list is: Racial problems, Maternity, Infant welfare, The health and physique of the school child, Sanitation of the environment and control of the food supply, Industrial hygiene, Prevention of infectious disease, Prevention of non-infectious disease, Education of people in hygiene and Research., enquiry and investigation.

[69] Allbutt, "The new birth of medicine," 433-38.

[70] Ibid., 437.

[71] Ibid. 433.

Allbutt praised advances in vaccine technology that had reduced the incidence of enteric fever among the troops compared with earlier wars in which deaths by disease exceeded those in battle. The emergence of the new medicine was he said, 'the enlargement from an art of observation and empiricism to an applied science founded on research.' Foremost in his praise for carrying out research was Edinburgh: 'a technical school with its technical professoriate animated by an academic spirit.' Allbutt advocated medical research, much more than Newman did, even calling for laboratories to be 'established in all Colonies.'

The New Zealand Parliament used Newman's work in formulating its new public health policy. Director of School Hygiene Dr E.H. Wilkins, championed Newman's preventive work in the Department of Health's 1921-2 Annual Report, agreeing that although the physical examination of children could 'degenerate into a form of drudgery', it could also provide the opportunity for valuable scientific work.[72] Wilkins lamented the lack of time officers could spend on the task:

> In view of the very large number of children passing through their hands, school medical officers have an exceptional opportunity to collect information of value in elucidating problems concerned with the health and education of children. … The large volume of work connected with their more regular duties, however, does not permit their devoting more than a limited amount of time to research of this kind.[73]

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[72] Annual Report of the Director-General of Health, *AJHR* 1921-22, H-31, 29.

[73] Annual Report of the Director-General of Health, *AJHR* 1922, H-31, 31.

Hercus initiates research into endemic goitre

Wilkins noted in his report that there were exceptions to his view that School Medical Officers were too busy to carry out research. These included the 'experiments' being carried on in Canterbury by Hercus and Dr Eleanor Baker, and in Wanganui by Dr Elizabeth Gunn, into the treatment of children with goitre. Working under the earlier Health Act during most of 1920, and pre-empting the new Health Act's requirements of officers to engage in research, Hercus collaborated closely with Baker, School Medical Officer in Christchurch, on a study of endemic goitre in schoolchildren in Canterbury and Westland. [74]

In what was to become a major preventive health study for New Zealand[75] and later the Otago University Medical School, beginning in April 1920, Hercus and Baker not only examined the schoolchildren for thyroid enlargement but also carried out some experiments with iodine prophylaxis.[76] Hercus and Baker's first paper appeared in *The New Zealand Medical Journal* in April 1921.[77] Hercus had recognised the potential of using schoolchildren in his study of endemic goitre, a condition also seen in adults, because they represented a section of the community that was 'the most accessible for examination purposes and the most important from a

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[74] Baker-McLaglan, *Stethoscopes and saddlebags*, 148-9; Charles E. Hercus and Eleanor S. Baker, "Statistical study of the incidence of goitre amongst the children of Canterbury and West Coast," *NZMJ* 20 (1921):116-21.

[75] Charles E. Hercus, W. Noel Benson and Charles L. Carter, "Endemic goitre in New Zealand, and its relation to the soil-iodine," *Journal of Hygiene* 24 (1925): 325.

[76] Hercus and Baker, "Statistical study."

[77] Ibid.

public health view.[78] The children represented 'an age period during which the functional activity of the thyroid is greatest,' he declared.[79] In this choice he was following Newman's recommendations to take up the 'exceptional opportunity' provided by the physical examination of children to advance knowledge.'[80] Hercus widened the age group to cover children up to 18 years of age – outside the primary school age group regulated by the Act and included teacher trainees at the Christchurch Training College. These trainees were found to be lacking in good health and in 1922, recruits became subject to examination by School Medical Officers.[81]

Hercus, having aroused the public's interest in endemic goitre may have delivered or co-written papers presented at the School Medical Officers' Conference in 1921, on 'A statistical study of the incidence of goitre' and a 'Report on a Goitre Clinic', but the presenters' names were not published in the *Appendices to the Journals of the House of Representatives*.[82]

Hercus and Baker's research quite eclipsed that of Dr Elizabeth Gunn, one of the first four female doctors to become School Medical Officers and a keen medical researcher. Gunn reported a serious spread of goitre among schoolchildren in the Wanganui area in August 1919.[83] She had not mentioned a goitre problem in an earlier report published in 1914 in the *New Zealand Medical Journal*, focusing instead

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[78] Hercus, Benson and Carter, "Endemic goitre," 325.

[79] Hercus and Baker, "Statistical study," 116.

[80] Annual Report of the Director-General of Health, *AJHR* 1920, H-31, 29.

[81] Tennant, "Missionaries of health," 128.

[82] Annual Report of the Director-General of Health, *AJHR* 1920, H-31, 29.

[83] "Fat necks," *Wanganui Chronicle*, August 28, 1919, 5.

on the defective teeth, physical deformities and a lack of vaccination among the pupils.[84] She suggested treating a number of female pupils with iodine if the Department would approve the trials and pay for the medicine. A report in *The Hawera and Normanby Star* on May 13, 1922, credited Gunn with having carried out such an experiment and achieving similar results as Hercus.[85] Gunn may also have carried out an experiment to prove that the health of schoolchildren would improve if taught in open-air classrooms in 1914.[86] She proposed keeping 60 Standard Two pupils in an 'open-air' classroom for a year and then comparing their health with another 60 pupils in an ordinary classroom. Whether she carried this out is uncertain, but her pro-active stance in advocating medical research using schoolchildren was ahead of Hercus's but does not seem to have made an impact, maybe because of her reported difficult nature, or it may reflect the attitude to female doctors in the male-dominated medical system of the time.[87] Hercus and Baker's work was much more extensive than Gunn's, covering a much larger population and gaining much publicity through Hercus's ability to promote his work. Gunn's attentions were diverted into the Health Camp movement, which began in the Wanganui area, leaving Hercus to head the goitre prevention studies as will be discussed in Chapter Four of this thesis.[88]

Hercus as bacteriologist

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[84] Elizabeth Gunn, "Medical inspection of school children," *NZMJ* 13 (1914): 374-9.

[85] "Goitre," *The Hawera and Normanby Star*, May 13, 1922, 5.

[86] Elizabeth Gunn, "Medical inspection," 374-9.

[87] Dr Mulholland, "Elizabeth Catherine Gunn, Obituary," *NZMJ*, 63 (1964):109.

[88] Tennant, "Children's health camps in New Zealand," 69-87.

Although Hercus concentrated first on studying endemic goitre in New Zealand and presented the first findings for his MD degree in 1921, he considered himself primarily a bacteriologist and an authority on military hygiene.[89] The evidence that he had had much practical bacteriological experience by 1920 is sketchy. He had had five years' experience dealing with men suffering from infectious diseases during the First World War, perhaps not doing much or any of the practical laboratory work himself but acting in a supervisory role. Pathologist D.T. Stewart claimed that because Hercus did not publish any original papers on bacteriology, he was not a 'bacteriologist.'[90] I will argue that he was very much involved in this field as his supervision of his students' studies and practical work in disease outbreaks will show and in experimenting with diagnostic tests for hydatid disease.

Hercus and other bacteriologists of the period would have been able to identify some causative bacteria or viruses of chickenpox, measles, whooping cough, poliomyelitis, diphtheria or influenza by microscopy or laboratory tests but could offer only isolation of the patient and good nursing care as treatment. The tests were often complex and unreliable. There were few vaccines available, notably for smallpox and typhoid, the latter available only in endemic areas from the Department of Health, which relied more on educating the public on improving hygiene and sanitary standards.[91] New Zealand produced its own smallpox vaccine in Wellington,

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[89] J. M. Twhigg, "Memorial Oration," *NZMJ* 62 (1963): 162.

[90] D.T. Stewart, *Pathology in Dunedin* (Christchurch, s.n., 1994): 23.

[91] D.E. Currie, "Dr A.B. Pearson and T.A.B. Vaccine," *NZMJ* 62 (1963): 52. In this letter, Currie recorded that Pearson's 'brilliant research enabled him to provide a potent T.A.B. vaccine for the Main Body, First N.Z. Expeditionary Force by October, 1914 … [the results were so impressive

and later Hercus would supervise its manufacture at Seacliff Mental Hospital near Dunedin.[92] Although outbreaks were rare in this country, they still occurred, notably in 1913 while Hercus was a student at the School, and again in 1920 in the Otago Health District. When the 1913 outbreak occurred in the Auckland area several of his classmates travelled north to vaccinate the nearby population, but Hercus did not join the group.[93] The Director-General of Health sent for six senior student volunteers to help re-vaccinate Maori whose vaccination had failed or who had never been vaccinated.[94] 'So many volunteers were forthcoming that Dr Champtaloup wired the Chief Health Officer, suggesting that the number be doubled.'[95] In the event, twelve students went north to assist. *The Auckland Star* named some of these students as they moved to different areas to carry out the vaccinations, and all received recognition in parliament in December.[96] Hercus did not join them, perhaps because there was a

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that New Zealand led] the world in the fight against typhoid diseases for those vital months of the Gallipoli campaign.'

[92] "New Vaccine Station," *The Evening Post*, May 4, 1925, 5.

[93] Derek Dow, "Student doctors' smallpox effort," *New Zealand Doctor*, March 18, 1998, 42.

[94] "Band of Medical Workers," *The Northern Advocate*, August 28, 1913, 4. It was suspected that the vaccine had been affected by heat in transit, and only 25 percent of the vaccinations were effective.

[95] "Volunteer Medical Students," *The Poverty Bay Herald* August 29, 1913, 7.

[96] "To the Front," *The Auckland Star*, August 30, 1913, 5. Those listed were Tapper, Watt, Myers, Haslet, Serpell and Cameron. In his original request, the Director-General of Health, Dr Valintine had asked Champtaloup for 'six active junior medical students to repatrol the districts of the north'. The students chosen were actually seniors; *The Poverty Bay Herald*, August 29, 1913, 7. So many men volunteered that Champtaloup asked for the number to be doubled.

ballot and he missed selection.[97] Dow highlights the fact that Hercus did not take part but it is on record that more students offered than were needed for this exercise and there is no evidence that he refused to take part.[98] Dow infers that Hercus felt some 'regret or guilt at having missed an opportunity to serve in 1913' and 'encouraged a number of his students to devote their compulsory public health dissertations to the topic of Maori health.'[99] This is most unlikely considering how much effort Hercus expended in his work with Maori in the Urewera Country in 1924-5 as documented later in this Chapter and his obvious interest in Maori health dating from his days as a dental student under Pickerill. The dissertations were never compulsory and mostly on topics chosen by the students as shown in Chapter Three of this thesis.[100]

While working in Christchurch in 1920, Hercus increased his experience and responsibility in bacterial research through supervising the Pearson Laboratory at the Christchurch Hospital on a part-time basis. Its Director, Dr A.B. Pearson and Dr S.T. Champtaloup (District Health Officer in Dunedin) were on study leave in the United Kingdom during this period.[101] Writing about this episode in 1994, pathologist D.T. Stewart believed that Hercus 'no doubt learned some practical bacteriology from Pearson's assistant, Edinburgh-trained Tom Ross.'[102] Hercus was considered sufficiently experienced when called upon to act temporarily as Government Bacteriologist for Otago-Southland in 1922.

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[97] Dow, "Student doctors' smallpox effort," 42.

[98] "Volunteer medical students," *The Poverty Bay Herald*, August 29, 1913, 7.

[99] Dow, "Student doctors' smallpox effort," 42.

[100] 'Smallpox epidemic,' *NZPD* December 13, 1913: 1151.

[101] Stewart, *Pathology in Dunedin*, 11.

[102] Ibid.

By the time that Hercus returned to New Zealand ‘the great age of bacterial discovery was well past’ and bacteriology focused on bacterial typing – breaking down the great bacterial groups, such as streptococci and staphylococci into their various types.[103] From 1916, Champtaloup typed tubercle bacteria in hospital cases of tuberculosis at the Otago Medical School. Doctors sent samples from around the country for analysis. The work was important in ascertaining the source of infection in humans, such as through contaminated milk. Champtaloup was very ill with tuberculosis himself and in November 1921, Hercus took over Champtaloup’s academic and hospital laboratory in an acting capacity.[104] This included the tubercle typing research, which Hercus later demonstrated to a meeting of the Otago Branch of the NZBMA in 1922.[105]

Hercus supervised bacteriological work, such as the performance of diagnostic tests including the Wassermann Test for syphilis and tests for hydatid disease, which, like endemic goitre was becoming common in New Zealand. All of these studies proved a rich source of material for his and his colleagues and students’ research in later years. In addition to being able to test for a range of infectious microorganisms in 1920, bacteriologists could make autogenous vaccines from quite a number of them.[106]The Acting Government Bacteriologist, T.R. Ritchie reported making 410

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[103] Lawrence, “Continuity in crisis,” 312.

[104] Brunton, *Medicine of the future,* 63.

[105] Anon., “Otago Division of New Zealand Branch of BMA,” *NZMJ* 21 (1922): 238.

[106] A. Clarke Begg, “Observations on the vaccine treatment of a series of cases of Staphylococcic infections,” *BMJ* 1 (1910): 189. Autogenous vaccines were made against a patient’s own infectious microbe to improve his or her immune response. ‘A vaccine is a suspension of dead bacteria in

such vaccines in 1919 against the bacteria that caused acne, gonorrhoea, typhoid and paratyphoid illnesses, as well as diphtheria and influenza.[107] These produced only mixed success.

Hercus moves into academia

Champtaloup died in December 1921 and Hercus was appointed as Professor of Public Health and Bacteriology at the Medical School in April 1922, having been acting in this capacity for several months. He had officially transferred to Dunedin on January 17, 1922 as Assistant Medical Officer, making it easier for him to complete his public health studies at the School.[108] He had completed several of the required courses while in Christchurch and over nine months studied meat inspection with a veterinary surgeon, chemistry at the University of Canterbury, clinical practice at the Christchurch Hospital and the Hospital for Infectious Diseases, as well as learning the duties of public health administration.[109] Hercus resigned as Government Bacteriologist on May 3, 1922.

Hercus's appointment at the School was controversial – the selection board chose another candidate, but following objections from the students he had been teaching and other complaints that Hercus was much better qualified for the position, the original appointment was rescinded and Hercus appointed.[110] Very much in his favour

normal saline, to which a little antiseptic is added. In order to make it we must have a pure culture of the organism. In many cases of Staphylococcic lesions we can get this from the patient's pus.'

[107] Inspector General of Hospitals Report, *AJHR* 1919, H-31, 21.

[108] Hercus was awarded his MD in 1921 and his DPH in 1922.

[109] ARC-0913 94-121-7 (1921).

[110] Carmalt Jones, *Annals*, 189.

was his outstanding war record, his commitment to completing a Diploma in Public Health and his expertise already shown in his relief teaching for Champtaloup. Hercus's war experiences ultimately helped him gain his professorship at the Medical School. His students, on hearing of his war service, petitioned the university to give Hercus another try at the position after he failed to achieve it the first time. What won Hercus the job was his spirited exposition on preventive medicine, based on the work of Sir George Newman, according to Carmalt Jones.[111] In his interview, Hercus quoted directly from Newman, who using a military simile stated 'the first line of defence [against disease] is a healthy, well-nourished and resistant human body.'[112] Hercus again used Newman's work when he overhauled the teaching for the DPH, emphasising the importance of disease prevention – 'not only the spread of disease but its occurrence. Its spirit must not be confined to public health alone but must pervade and inspire all branches of medicine.'[113]

Far from being a break from practical work with the Department of Health, Hercus's new appointment in academia presented him with an opportunity to maintain relationships and improve public health through co-operative research for many years. Working for the Department of Health had allowed him to study for further qualifications, which ultimately ensured his appointment at the School, and gave him an understanding of public health administration in New Zealand. He made many acquaintances that would become useful to him in his research and career in public health. The co-operation of officers of the School Medical Service was essential for

[111] Ibid.

[112] Newman, *Outline of preventive medicine*, 9.

[113] Hercus and Bell, *The Three Deans*, 259.

his goitre studies. They collected data for him for several years from throughout the country and played an important role in administering iodine prophylaxis to children and in educating the public on goitre. He was able to carry out research with financial support from the Department, which must have given him a great advantage over practising scientists at this time. After joining the staff of the School, Hercus continued his goitre research with Baker, who was administering 'very small doses of iodine' to school children in Christchurch.'[114] Bringing an existing research project into the School must have been a spur to other research projects at the School.

The benefits of close co-operation with Hercus as Professor of Public Health also promised to aid the Department of Health, reported the Director E.H. Wilkins in his Annual Report for 1922. Hercus had organised one of Dunedin's School Medical Officers, Dr Mecredy to lecture to medical students in the public health course on how the scope and aims of the service aided the practice of preventive medicine and encouraged better co-operation between practising doctors and Departmental officers.[115]

Now established within the School, Hercus could broaden his interests in research and set up projects with the authority he had achieved during his time with the Department. He was skilful in obtaining funding from the government and in gaining the co-operation of hospital management to carry out experiments. In addition, Hercus introduced changes into the teaching of public health that would have a lasting impression on the students and in some instances, on the public. Senior students in their fifth year now had the option of researching a topic in public health and

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[114] "Goitre," *The Hawera and Normanby Star*, May 13, 1922, 5.

[115] Annual Report of the Director-General of Health, *AJHR* 1923, H-31, 39.

presenting their dissertations at the conclusion of the year to Hercus and to their classmates. These dissertations have been largely preserved in the Medical School Library and offer an important resource for students studying New Zealand's medical history. Many cover Hercus's particular areas of interest such as goitre and hydatid disease, adding valuable data for his own papers. I will discuss these dissertations in depth in Chapter Three. One of these dissertations was invaluable as a source of information on the work Hercus did among the Maori of the Urewera Country in 1924.

Hercus's Urewera trip

This trip represents the only evidence that Hercus used his dental skills to any degree and illustrates his early contact with Maori. It is important as it gave him first-hand knowledge of how these people lived and allowed him to educate them in good hygiene practices to prevent illness, using his sanitary skills learned in the military and taught in his Public Health course at the School. The Maori prophet, Rua Kenana rewarded him handsomely with the presentation of a taiaha (ceremonial club) for helping his people.[116] This thesis corrects several of the published accounts of this venture in minor details found in Hercus's unpublished material held in the Medical Library and in documents in the Hocken Library.

In 1924, Hercus, by now a professor at the Otago Medical School, was researching endemic goitre, which was said to be common in the Urewera Country, and ventured

[116] Interview with Mary Hercus-Rowe, September 22, 2010. The family still have this taiaha.

into the area to see it were true.[117] His aims included carrying out the Schick, Dick and Mantoux reactions to test for exposure to diphtheria, scarlet fever and tuberculosis respectively.[118] While there, he also planned study the diet and the teeth of the Maori and repeat Pickerill and Champtaloup's dental surveys. The Medical and Dental Schools were closely aligned in Dunedin, so it is not surprising that they shared an interest in dental caries – a consequence of this country's low levels of fluoride in drinking water supplies and people's dietary choices. This work seems to be the only record of Hercus's using his dental skills – even in his reminiscences about his war experiences he does not mention carrying out dental work. Hercus partly confirmed Pickerill's description of the diet in 1925, but there had been changes in the intervening years:

> Fern root had been given up by about 1870, pork was the principal animal food. Rainbow trout was an irregular source of food. They also ate native pigeons and eels, no milk but some used condensed milk. Potatoes formed the basis of the dietary. White flour and sugar were high priced … the diet was monotonous, ill-balanced and deficient in mineral salts and water soluble vitamin B. It makes but feeble demands upon the masticatory apparatus and favours the deposition of detritus around the teeth and gums. The diet is inadequate therefore for the

[117] Elsdon Best, *The Maori* (Wellington: Board of Maori Ethnological Research for the Author and on behalf of the Polynesian Society, 1924), 49; "Children's health," *The Evening Post*, May 23, 1924, 6. School Medical Officer Mecredy reported finding a well-defined goitrous area in the Bay of Plenty, with its apex in the Urewera Country in 1924. Mecredy also reported only half the incidence of caries in Maori children's teeth compared with those of 'white children.'

[118] North and Suckling, "Tuhoe: their teeth and thyroids."

development of healthy bone and tooth tissue. It should be noted that that this defective diet has left its mark on other tissues than that of the teeth. Malnutrition, particularly among the children was widespread.[119]

Hercus travelled into the Urewera Country accompanied by one of his students, William Bird, and William's father, a senior school inspector from Wellington, 'who not only had an intimate knowledge of the Maori language and of the district but was also favourably regarded by the chiefs of the Tuhoe.'[120] On his way into the area, Hercus set up a dental clinic in Te Whaiti to treat the 100-strong population from the Ngatiwhare tribe in the hamlet. In January 1925, Hercus wrote to Sir Lindo Ferguson, Dean of the Medical School, from Te Whaiti, 'this furthest outpost of civilization as represented by the N. Z. Post & Telegraph Department.'

My introduction has been by way of a dental clinic which I had perforce to establish. I have extracted over 20 teeth already. For once dental caries has

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[119] C.E. Hercus, "Diet and teeth of the Maori," 14-15.

[120] Ibid., 2. This account corrects Mark Derby's report that Hercus arrived in a group that included his [Hercus's] son, a medical student'. Mark Derby, *The Prophet and the Policeman: the story of Rua Kenana and John Cullen* (Nelson: Craig Potton, 2009), 112. William Bird (snr) was Chief Inspector of Native Schools in 1913, Chief Inspector of Primary Schools in 1925 and Superintendent of Native and Island Education in 1930. He was one of Bishop Herbert William's advisers for the revision of the Maori Bible in the 1920s. William (jnr) graduated M.B. Ch.B. in 1925. Dr William Anderson Bird, Personal File, held at the Cotter Medical History Trust, Christchurch.

> served me in good stead. The work promises to be of great interest if I can overcome their prejudice to the needle.[121]

Unlike Pickerill, Hercus reached Maungatapohatu, Rua's village, but he found that his medical not his dental skills were desperately needed. There had been an outbreak of typhoid, especially among the children, and three people had died.[122] Hercus immediately sent for assistance from the Department of Health for supplies of vaccine and set up a cordon around the village. A Presbyterian Maori Mission Sister, Annie Henry came from Ruatahuna to help in the camp set up by the Department and recollected the impressive manner in which Rua mastered the necessary medical knowledge that Hercus gave:

> Dr Hercus …told Rua what the disease was. With a scrap of chalk, he drew on a board a diagram of a normal stomach of a patient suffering from typhoid, to show Rua why patients … should not be given any solid food, however much they pleaded for it – because in typhoid, the wall of the stomach becomes thin, so that a piece of solid food can puncture it, killing the patient. When two Health Department nurses arrived, we left. As soon as Rua met them, he produced a piece of chalk, sketched on a board exact reproductions of Dr

[121] Hercus to Lindo Ferguson, January 3, 1925. ARC-0913 94-121/16, (1925). Hercus had arrived back in Rotorua by January 25, 1925, indicating his trip into the Urewera Country lasted less than a month. His records show that he examined people in Ruatahuna, Te Whaiti, Ruatoki and Maungapohatu.

[122] Judith Binney, Gillian Chaplin and Craig Wallace, *Mihaia: the prophet Rua Kenana and his community at Maungapohatu* (Wellington: Oxford University Press, 1979), 152.

> Hercus's diagrams, and used them to explain to the nurses …Yes, Rua was an intelligent man, willing to learn and quick to grasp knowledge.[123]

On taking charge of the situation, Hercus established a Maori Committee, headed by Rua, to contain the outbreak.[124] Rua was to report any new cases of typhoid and insist on the vaccination of anyone entering or leaving the district. The committee had to ensure the supply of fresh cows' milk and fuel to the tent hospital. Hercus's quick actions and the assiduous care of the nurses meant there were no further deaths from the outbreak. Hercus also advised Rua on how to improve hygiene in the village by clearing out the wells, building new homes with outside lavatories and pulling down the existing wharepuni (sleeping houses). Binney wrote:

> Once again a whole village was constructed. The houses were built of slab and single, each with a galvanised iron roof. The origins of their design and probably the entire concept of the community, lay with the conversations which Rua had with Charles Hercus, Professor of Public Health and Bacteriology from

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[123] Ibid.

[124] Henderson, *Maungapohatu trip*, 5. Dr Henderson, Inspector of Health was one of a small group of three nursing sisters and a doctor who responded to Hercus's call for assistance and stayed in the village for several weeks until the situation was resolved; Judith Binney, "Maungapohatu revisited: or, how the government underdeveloped a Maori community," *Journal of the Polynesian Society*, 92 (1983): 353-92. Binney says that Pita Te Wharenui, one of the leaders of the Rua faith headed this committee, but it is possible that Henderson's first-person account was more accurate.

Otago University after the typhoid epidemic which broke out at Maungapohatu early in 1925.[125]

While in the Urewera Country, Hercus also examined the Tuhoe tribe for signs of goitre and carried out some preliminary anthropomorphic measurements, but did not publish the results.[126] He was prepared with 'callipers, literature and valuable advice' given to him by Mr H.D. Skinner, lecturer in anthropology at the University of Otago.[127] He encountered 'considerable difficulties' in trying to determine the incidence of blood types', but successfully measured mostly facial characteristics of 'only pure-blooded Maoris … and with two or three exceptions all were members of the Tuhoe line and had been resident all their lives in the Urewera. Their ages varied from three years to 85 years. Hercus did not publish this work, which he regarded as having confirmed Peter Buck's findings on tribal distribution of head forms. Hercus did not repeat this excursion into anthropology and dentistry but did assist two of his fifth-year students to study the condition of Maori teeth in the summer vacation of 1936 -37 for their preventive medicine dissertation.[128]

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[125] Binney, "Maungapohatu revisited," 357-8.

[126] North and Suckling, "Tuhoe: their teeth and thyroids."

[127] Hercus, "Diet and teeth of the Maori." Skinner was the first anthropology lecturer in Australasia and Assistant Curator at the Otago Museum. He held unconventional views on Maori origins and may have used Hercus's data in his own research.

[128] North and Suckling, "Tuhoe: their teeth and thyroids." Their survey investigated public health issues such as housing, sanitation and personal hygiene, in addition to assessing numbers of carious teeth. Hercus provided contacts, such as Sister Annie Henry, who traced some of Hercus's former cases for the students to study. The students found fewer caries in Maori teeth, but not as many as

Conclusion

The aftermath of the First World War brought awareness of the deteriorating state of health of the populations of Britain and her allies, including New Zealand. The ideals of the National Efficiency movement, founded on eugenic principles influenced medical men, Hercus included, who acted to improve public health by preventive means. The world was recovering from the 1918 influenza pandemic as Hercus returned to New Zealand and the Department of Health undergoing restructuring as a result. The School Medical Service, which was to assist Hercus in many of his research efforts, was brought into the Department of Health from the Department of Education with the passing of the 1920 Health Act. Hercus's early employment as Assistant/Junior Health Officer gave him the opportunity to train in Public Health and re-familiarise himself with laboratory work, having spent most of his war years 'in the

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Hercus had. 'The fact that Hercus found a higher incidence of caries that we did is probably explained by the fact that he examined with a probe, while we relied solely upon careful inspection.'; J.Ll. Saunders and R.M.S. Taylor, "The dental condition and diet of the Maoris of Maungapohatu Village," Annual Report of the Director-General of Health, *AJHR* 1937, H-31 Appendix C, 64-66. These two men visited the area some months before the students and published their results the following year. John Saunders, a former classmate of Hercus in the early 1900s was now Director of Dental Hygiene for the Department of Health and Richard Taylor was a dental and physical anthropologist, later Principal Dental Officer in Auckland. Whether Hercus and his students were aware of this visit in May 1936 is not clear, but the results of the two studies were very similar, finding the introduction of European foods, especially white flour, had been detrimental to the inhabitants' teeth. The students visited other settlements in their study, unlike the two dentists who focused only on Maungapohatu.

field’ and very little time in hospitals. There was much to be done to eliminate childhood infectious diseases, dental caries and endemic goitre in New Zealand in 1920.

The war not only exposed the need to improve people’s health, it also brought recognition that the country needed to improve its scientific research in line with other countries in the British Empire. The result of much debate in New Zealand was the establishment of the DSIR, bringing together several existing research efforts into a cohesive structure, by 1926. This research, begun in the mid-nineteenth century, included exploring the new country for its mineral resources, investigating and mapping its geology and studying the fauna and flora. This research was largely academic with an emphasis on cataloguing the native animal and plant species, expanding into finding how the tutu toxin acted through experimentation on animals, and testing fish for their value as a food source. Scientists also studied the archaeological remains of extinct fauna and the Maori. There was no provision for medical research within the DSIR structure and no plans to build a medical research institute despite pressure from the NZBMA.

Hercus had, by 1922, qualified in public health and brought a well-established research programme into the Medical School where a culture of research was well ahead of its Australian counterparts. While other medical men suggested research should be done on understanding and preventing endemic goitre, Hercus took up the challenge and carried it out. Some of the early professors at the School had research projects underway by the time Hercus took up his role as Professor of Bacteriology and Public Health, but his goitre research project was to enhance the reputation of the School as a site of innovative research for over many years, as explored in Chapter Four of this thesis. Hercus had also made important connections within the

Department of Health that would assist him greatly in carrying out research in the years ahead. Hercus encouraged many of his students not only to help his research efforts but to take part in their own medical research projects as part of their Public Health course and this is the subject of Chapter Three of this thesis.

Chapter Three: The Student Dissertations

It was typical of Hercus to have brought in the student theses.—Margaret Guthrie, 2011[1]

It was a brilliant idea and it has never occurred since; it is not happening now. —Duncan Adams, 2012[2]

Introduction

In introducing the student dissertations to the fifth-year Public Health students, Hercus began a programme of individual studies that has left an important legacy not only for the Medical School's library collection, but also for the students themselves. They learnt, not always willingly, to carry out a unique research project and to present their findings at least to their fellow students, or in some cases to the world in different publications.

Hercus was able to use these dissertations to help verify his own research findings and to publicise the research capabilities and achievements of the Medical School. His great energy and capacity for work allowed him to carry out this programme throughout his employment at the School, in spite of increasing student numbers, the work of the MRC and his role as Dean. At the time of his retirement in 1958, at least 2000 of these had been produced. Not all of the dissertations have survived in the collection held in the Medical School Library, especially those from the earliest times. The studies were not compulsory and it is unclear if the 'missing' dissertations

[1] Interview with Dr Margaret Guthrie, May 8, 2011.

[2] Interview with Dr Duncan Adams, February 23, 2012.

(compared with the student roll) were ever undertaken. Students could choose to sit an examination in Preventive Medicine instead.

The students could choose one of many topics, such as maternity, infant and child welfare, school hygiene, environmental problems, industrial hygiene, sanitation, water supply, infectious diseases, the milk supply, or medico-social problems in relation to general practice.[3] Over the thirty-five year period that this thesis covers in relation to these dissertations, the topics studied reflect changes in the history of New Zealand's urban infrastructure to provide clean water and adequate sewerage, advances in immunisation of children against infectious disease, the slowly improving conditions of Maori housing and welfare as well as an increasing awareness of industrial health.

The students also contributed epidemiological data on diseases such as cancer and on the rising incidence of hay fever caused in part by imported grasses, as well as on the occurrence of hydatid disease and educating the public on the means of its eradication. By the 1930s there was widespread interest in proprietary medicines in New Zealand, fuelled by excessive newspaper advertising. Hercus's students investigated several of these and proved that they were of no use for treating endemic goitre and some were indeed harmful. The topic of child health was popular with the students and a major part of the work of the Department of Health over the period. Many students provided immunisation for diseases such as diphtheria, studied school children for preventable illnesses such as endemic goitre and investigated the Health Camp Movement.[4]

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[3] Brunton, *The medicine of the future*, 70

[4] Tennant, "Children's health camps," 86.

A chance to express one's talent: the fifth-year project

A major contribution made by Hercus in fostering research at the Medical School was his introduction in 1923 of the option for students to prepare an original piece of work and present it as a thesis or 'dissertation' in the Preventive Medicine course in the fifth year of their studies.[5] Duncan Adams commented that 'Hercus tried to copy the very best of the academic world as a medical leader. He applied the principles of a master's thesis to Public Health with the student theses.'[6] Hercus wrote in 1924 that although 'the hard-pressed medical student has not the time, even if he was possessed of sufficient experience and knowledge, to engage in what is generally regarded as research work,' he found that he had been able to bring 'the great majority of the students into personal contact with some investigational work.'[7]

> Each student, working singly or in pairs, was required to study more intensively some facet of the wide field available, to present his findings in the form of a thesis, which was carefully criticised as a contribution to scientific literature, and in the last weeks of the course to be prepared to answer questions on his

[5] The terms 'dissertation' and 'thesis' are used interchangeably in this thesis. The Medical School's collection is of student 'dissertations'. Some former students believe the term 'thesis' is more accurate a descriptor, or even 'essay'. Sir David Hay recalls that they were called 'theses' in his time at the School.

[6] Interview with Dr Duncan Adams, February 23, 2012.

[7] C.E. Hercus, preface to "Studies from the Department of Preventive Medicine," *NZMJ* 23 (1924): 27.

> subject. Many of these studies were subsequently published in *The New Zealand Medical Journal*, marking the student's first attempts at scientific writing.[8]

His colleagues wrote of their approval of the scheme, Barnett describing it as 'an excellent scheme of field work and research' especially in his field of research into hydatid disease where '[the] work is mostly done by country students in their vacations.[9] Carmalt Jones wrote about the programme, commenting that it was very popular with the students:

> Within the last ten years [1920-1929] the laboratory and practical teaching has been very much developed and the tendency is to restrict didactic instruction in favour of practical work. To indicate this change I may say that the professor of Public Health gave his class of 60 students this year the option of a class examination at the end of the year or a piece of research work. All but two of the class chose the research … The spirit for research was admirable, and I doubt if ten years ago, we could have got a pair of students to have voluntarily scoured the city and suburbs to collect dog fæces to determine the regional prevalence of tapeworm.[10]

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[8] Hercus and Bell, *The Three Deans*, 259-60.

[9] L. Barnett, "The incidence of Hydatid Disease in New Zealand," *NZMJ* 33 (1934) reprinted in *The Proceedings of the Otago Medical School*, 1936, unpaginated.

[10] Carmalt Jones, *Annals*, 197.

His promotion of exceptional dissertations via the publications mentioned may have ultimately had an effect on the health of New Zealanders while enhancing the research reputation of the Otago Medical School. Both local and international recognition of Hercus's novel idea of asking his students to do these studies was forthcoming early in various journals and books and he commented on the students' efforts in his prestigious Hudson Lecture in 1950:

> For over twenty years the undergraduate in his (sic) fifth year of medical studies has been encouraged to undertake some piece of original investigation in the wide field of social and preventive medicine. While some studies have naturally been immature and not worthy of publication, many represent genuine and good pieces of research, a number of which have been published in local scientific journals. The carrying out of this work had the advantage that students gain some insight into the conditions under which research is carried on, learn to weigh evidence, to consult first-hand sources of information, and to distinguish between matters of fact and matters of opinion.[11]

In 1969, Duncan Adams contributed an article to *The Otago Daily Times* that alluded to these dissertations and claimed that they provided a way for individual students to shine in a curriculum otherwise tended to obscure originality 'under the burden of examinations.'[12] Not all of the dissertations have survived in the collection in the

[11] Hercus, "Second Hudson Lecture," 109.

[12] D.D. Adams, "Medical School, 'Hercus Building': home of famous research," *Otago Daily Times*, February 24, 1969. (Newspaper clipping in Cotter Medical History Trust Hercus file)

School's library, especially those from the earliest times and some of those that were subsequently published in various journals. The studies were not compulsory and it is unclear whether the apparent absence of a dissertation from the collection indicates that the particular student chose to sit the end-of-year examination instead of completing a research study.

Choosing a topic and executing the dissertation

As already documented, Hercus certainly achieved much through the work of students who chose to study his own areas of research interest such as endemic goitre and hydatid disease – they provided invaluable material for him to counteract opposition from competing researchers. Whether he asked them to carry out these studies is generally not documented in the students' work but it appears that he did outline 'which sort of studies he would smile on,' when he addressed the class about their research project at the end of their fourth year.[13]

Students that I was able to interview were in their fifth year in the period from the late 1940s and into the 1950s reported that Hercus did not routinely help students choose a topic. There is evidence in some studies that he did suggest suitable topics to students, such as investigating an outbreak of diphtheria in Kaitangata in 1926, as documented earlier, and providing help to the Medical Officer of Health to inoculate people in the district.[14] He also recommended a pair of students investigate the relationship between sunlight and skin cancer in 1933, and another student carry out a

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[13] Interview with Dr Maarire Goodall, August 10, 2013.

[14] H.C. Barrett and J.H. North, "A study on diphtheria." (Unpublished Student diss., University of Otago, 1926).

study of alternative medical practices in Auckland in 1955.[15] In these dissertations, the students thanked Hercus specifically for his help in choosing their topics.

Most students appear to have chosen their own topics, many carried out in places of summertime employment at the end of the fourth year. The option of choosing one's own topic was what made the undertaking attractive to some students. Adams asserts that: 'the extraordinary thing about Hercus's theses was that they were unsupervised. You could do anything you liked. This allowed people with originality to show up.'[16] This statement must be modified a little in the light of what some students have written about getting help from Hercus, however. Sir David Hay would concur with Adams – his choice of studying the effects of maternal rubella on the child was critical to his producing what others recognised as an outstanding thesis at the time.[17] Hay remembered the thesis as producing 'a very significant landmark in my career and perhaps the most worthwhile research I have done.' He commented that he thought 'you were supposed to [tell Sir Charles] what you were doing, but it was very much left to students to make their own decisions. I know that Sir Charles wasn't involved with my choice or subject.'[18] Brigadier Dr Brian McMahon recalls that Hercus had to approve his study in 1954, which, as it concerned physical

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[15] M.R. Boyd-Wilson and N.C.F. Hill, "Significance of sunlight as a causal agent in cancer of the skin" (Unpublished Student diss., University of Otago, 1933); A.M. Abrahams, "Quackery or a study of unorthodox medical practitioners in Auckland" (Unpublished Student diss., University of Otago, 1955).

[16] Interview with Dr Duncan Adams, February 23, 2011.

[17] D.R. Hay, "Relation of maternal rubella to congenital deafness and other abnormalities" (Unpublished Student diss., University of Otago, 1949).

[18] Interview with Sir David Hay, June 19, 2013.

education and the wellbeing of women in childbirth was likely to have been a topic that interested Hercus.[19]

A contemporary account of Hercus's student programme perhaps reveals how involved he was in assisting the students to carry out their dissertations.[20] Following a visit to Dunedin from Professor G.W. Pickering, the Sims Commonwealth Travelling Professor for 1949, the following report appeared in *The British Medical Journal*:

> Professor Pickering was impressed by a method of teaching used by Sir Charles Hercus, professor of bacteriology and preventive medicine. Each pair of students is given a problem to be worked out during the long vacation in the fifth year. The problems are chosen according to the aptitude of the student. After they have gathered their data they consult previous work, and relating their own results to it, write a thesis. Then these theses are read to the group, discussed, and criticized. It is a method that should be more widely adopted but it needs a teacher with the requisite imagination and energy, for it is very exacting on him.[21]

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[19] Interview with Brigadier Dr Brian McMahon, May 19, 2011. McMahon's thesis was "A comparison of the attitudes towards and experience in childbirth of trained physical educationists and a sample of the general population" (Unpublished Student diss., University of Otago, 1954).

[20] Anon., "Sims Commonwealth Professorship: Report for 1949," *BMJ* 1 (1950): 1194.

[21] Ibid. Although it is likely that all students did present their work to the class, this was not the case in later years when only selected ones did, perhaps because of Hercus's increase workload in other areas.

Even if Hercus did not direct my interviewees in their choice of study, perhaps due to the increased number of students and his heavy workload as Dean and his MRC roles, he may have directed some students in the 1930s to help him confirm his own research findings. Such may have been the case in his counteracting opposition to his goitre/soil hypothesis that other scientists put forward concerning the Taranaki and Thames areas, as documented in Chapter One of this thesis.[22] He would not have had time to carry out this research this for himself. The students were able to show that the postulated anomalies did not stand up to further analysis, thereby maintaining Hercus's hypothesis.

It is also possible that he asked students to repeat some early work of his, such as his study of the health of Maori in the Urewera Country in late 1925 and early 1926.[23] He certainly assisted by giving the two students his notes and results.[24] Their dissertation includes Hercus's records of dental records and anthropological measurements as an Appendix and appears to be the only remaining source of this otherwise unpublished work.[25] In 1930, two other students in carrying out a survey of Maori life on the East Coast appear to have had access to Hercus's records as they wrote:

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[22] C.E. Hercus and H.D. Purves, "Studies on endemic and experimental goitre," *Journal of Hygiene* 36 (1936): 188; H.D. Law and A.L. Lomas, "Endemic goitre in Taranaki in general and New Plymouth in particular" (Unpublished Student diss., University of Otago, 1937); C.L. Watson, "Goitre in Thames" (Unpublished Student diss., University of Otago, 1938).

[23] See Chapter One of this thesis.

[24] A. North and L W. Suckling, "Tuhoe study," see Chapter One of this thesis.

[25] Ibid.

> [Hercus had found that] 50/159 Maori school children in the isolated Urewera Country had skin diseases. Here again, scabies predominated. … Hercus in the more isolated Urewera district found 15 cases of eye infections in a series of 159 Maori school children.[26]

Hercus gives practical help to some students

Although Hercus wanted the students to take the initiative with their dissertations, often he did help by suggesting that the students approach officials from appropriate government departments for assistance, or other specialists such as an ENT surgeon for a study on tonsillitis, the directors of sanatoria for student studies on tuberculosis, or permission from other institutional heads. In some cases, he helped with introductions. The government departments including the Departments of Health, Education (the schools in Dunedin were prime targets for the student studies) and Agriculture, the DSIR, Mental Hospitals and the office of the Government Statistician. He also suggested suitable readings for the students. The dissertations on endemic goitre exhibit lengthy reference lists that almost invariably included the Otago research publications. Students sometimes studied with other staff of the School or within the university: McMahon studied under Smithells at the School of Physical Education and some students studied children in the Health Clinic at the Medical School.[27]

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[26] G.R. Butterfield and G.R. Kirk, "Public health survey of Maori Life on the East Coast" (Unpublished Student diss., University of Otago, 1930).

[27] See Chapter Seven of this thesis for more on Philip Smithells, Director of the School of Physical Education in Dunedin.

Hercus expected the students to work independently, alone or in pairs, but there were exceptions, especially when he needed help to gather information for his own research, in which case he offered his own practical assistance. He needed consistent data so he instructed students in how to assess the size and nature of goitres in school children, advised others on how to collect data on hydatid disease and educate farmers in preventive measures. By 1937 he and Barnett had provided students with a checklist for hydatid disease surveys.[28] In the dissertations that explored the use of bacteriological tests and providing immunisations to schoolchildren, he or Morris Watt were likely to have instructed the students in these areas as part of the bacteriology course held in the students' fourth year.

By the 1930s, industrial hygiene was becoming important with the passage of Parliamentary Acts to protect workers. Hercus alluded to the recent developments in the field at a meeting of the Clinical Club in July 1934 and reported that some of students had been investigating different industries throughout New Zealand.[29] Of major concern was the risk of lead poisoning in paint manufacturing businesses, porcelain manufacturers and in newspaper printers. Several students explored these businesses with alarming results but did not find a large number of ill workers. In 1932, Hercus assisted John Bradbury in one such study:

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[28] D.G. Cumming and J.H. McGregor, "Epidemiology of hydatid disease: Hawkes Bay, New Zealand" (Unpublished Student diss. University of Otago, 1937); L. Barnett, "Hydatid disease," *NZMJ* 36 (1937): 115-16.

[29] Hercus, "Minutes of the 124th meeting of the Clinical Club July 13, 1934," 185.

> [Professor Hercus held] the guiding reins throughout. Not only did he suggest and facilitate the line of attack, but also spent much of his time examining blood films, criticising the earlier efforts of composition, guiding me to references and stimulating me throughout with his personal interest in the work.[30]

Hercus's practical help extended to travelling with students W.B. Andrew and R.W. Maxwell to visit schools and orphanages in Dunedin and Timaru to investigate the incidence of goitre in the children.[31] The students' task was to investigate their diets and ascertain whether they were eating iodised salt. This was in 1927 when arguably Hercus had more spare time than in later years. Hercus and his students often chose to study children in orphanages, especially in Dunedin. Although it is hard to prove, Hercus may have had a special understanding or an agreement to do this. This understanding, if it did exist, did not extend until 1949, at least in the case of R.E. Rawstron and N.R. Jefferson who were refused permission to study children in a state-run orphanage.[32] A church-run orphanage did allow them to study its children, perhaps because Jefferson's father was a minister in the church. This somewhat

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[30] J.F. Bradbury, "Industrial lead poisoning: Wellington" (Unpublished Student diss., University of Otago, 1932).

[31] W.B. Andrew and R.W.D. Maxwell, "An investigation into the incidence of endemic goitre among children of school age in Timaru together with some observations on the prophylactic and therapeutic value of iodised salt" (Unpublished Student diss., University of Otago, 1927).

[32] Interview with Dr R.E. Rawstron, June 11, 2013; R.E. Rawstron and N.R. Jefferson, "The effect of environment on the child: a public health survey of children involving a comparative study of two individual groups of children living under different environmental conditions" (Unpublished Student diss., University of Otago, 1940).

defeated the original purpose of the study which was to make a comparison of the two establishments, but the students compensated by studying a group of Dunedin school children in their own homes and while they were staying at a nearby Health Camp. Carrying out these studies challenged some students to teach themselves new skills at times, such as epidemiology in Sir David Hay's case.[33]

The general studies

Although somewhat dismissed by students who chose to study a specific problem, the more general studies offer a valuable insight into the environmental challenges facing New Zealanders' settlements of the period – the supply of clean water, removal of sewage, the prevention of contaminated milk and the state of people's housing.[34] These studies were often of entire cities and towns from a public health and preventive medicine point of view. Students often worked with officers of the Department of Health in these studies. Whether the students' findings made a difference is unknown, but the wide-ranging studies indicate that the students learned a great deal about town planning and the health effects of poor sanitation. One study that did have a useful outcome was an investigation into shellfish contamination in the Manukau Harbour.[35] W.F. Parkes and P.J Scott were able to show that effluent

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[33] Interview with Sir David Hay, June 19, 2013.

[34] A.L. Noakes and H.L. Howell, "Public Health survey of the city of Auckland" (Unpublished Student diss., University of Otago, 1926). This ambitious comprehensive survey is an example of one of the general theses.

[35] W.F. Parkes and P.J. Scott, "Investigation of shellfish contamination and its significance for public health in the Auckland area" (Unpublished Student diss., University of Otago, 1954); Bill Parkes, *The fair beginning of a time* (Whangarei, Inder Publications, 2003): 70.

disposed of into the harbour washed back onto the beaches. Their study provided valuable information for local authorities on where to process effluent safely.

Hercus would have taken an especial interest in these studies in his role as the only South Island resident member of the Town Planning Board, appointed in 1927.[36] Miller suggests that his appointment 'may have reflected the attempts of the Health Department to have a representative on the Board. While Hercus was a medical authority, he was not a health bureaucrat, and therefore would be expected to bring a more independent view than that of the Department.'[37] Hercus served on the Board until 1940, making little progress and finding the position frustrating.[38] In 1940 Hercus wrote to Dr L.S. Talbot of Timaru who had just been appointed in Hercus's place, that he had found the progress extremely slow and 'each government that I served under seemed most dilatory in providing a progressive piece of town planning legislation which would enable real progress to be made.'[39] One student's historical study of public health in Otago provided Hercus with the basis of an address given to *The New Zealand Branch of The Royal Sanitary Institute* in 1948.[40]

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[36] "Town Planning," *The Evening Post*, February 2, 1929, 10.

[37] Caroline Lomax Miller, "Town Planning in New Zealand 1900-1933: The emergent years" (PhD diss., Massey University, 2000): 412.

[38] Hercus to Dr L.S. Talbot, January 30, 1940. ARC-0193 94-121/ 51 1940.

[39] Ibid. Talbot had contacted Hercus for approval of a study of 'Heliotherapy in the Mackenzie country' for his son's dissertation. Hercus's reply included congratulations on Talbot's appointment and approval for his son's plan.

[40] E.M. Elder's 1935 thesis is missing from the Collection. Sir Charles Hercus, "Some notes on public health in Otago from 1848-1876," *Journal of The New Zealand Branch of The Royal Sanitary Institute* 9 (1948): 293-306.

An ideal way to teach preventive medicine: the Otago University Health Clinic

Some students carried out the practical work for their theses using the resources of the Otago University Health Clinic set up in the Medical School with the aim of 'teaching of preventive medicine in its broadest meaning.'[41] The clinic was organised to give a special service to the community that Hercus hoped would become adopted more generally as the students moved on to become general practitioners. The clinic initially drew upon the population in a specific part of the city near the Medical School encompassing the 'part of town which drains to the [five] schools in the district.'[42] A doctor, Public Health nurse, and a Home Science graduate staffed it the clinic and had close liaisons with welfare groups such as Plunket, Child Welfare and church organisations. Whole family groups attended the clinic at times. Senior students in their fifth year worked for a week in the clinic, and some examined the health implications of the children's home environment. He hoped that the students' meeting with people in their homes might 'cultivate the preventive spirit in [the future practitioner's] daily encounters with disease.[43]

Several students carried out immunisation studies on children attending the health clinic in class groups, as well as visiting schools and children's homes in 1945.[44]

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[41] Anon., *The Otago University Health Clinic*, undated ms. Sir Charles Hercus Collection, Box 10, Medical Library, University of Otago, Dunedin.

[42] Ibid.

[43] Hercus, preface to "Studies from the Department of Preventive Medicine," 27.

[44] W.B. Craig, J.F. Hare and T.A .Hurrell, "Diphtheria prophylaxis: immunisation of George Street School children carried out as part of the course of preventive medicine" (Unpublished Student diss., University of Otago, 1945); G.A. Waddell and V.B. Cook, "Pertussis vaccination: a study of

From the early 1920s, Hercus's students were able to study primary school children in many schools in Dunedin, Oamaru and on the Taieri Plain. In addition, they examined pupils from some secondary schools and students in residential colleges in the Otago and South Canterbury areas, where they not only administered vaccines, but also evaluated the efficacy of bacteriological tests, and in some cases assessed the efficacy of iodine prophylaxis to prevent endemic goitre. They also studied children in orphanages in Dunedin, Oamaru and Timaru.

This assistance was likely to have been invaluable to Hercus and his research aims within preventive medicine. Another useful aspect of the studies was the students' exposure to the social aspects of disease in the community. Many students included home visits in towns and in the countryside in their studies, particularly in the incidence and prevention of endemic goitre and hydatid disease. It was quite a shocking experience for some students to meet with resistance to their promotion of good health standards. 'We studied the farmer as much as the disease,' said two students attempting to persuade one farmer to follow the procedure necessary to prevent hydatid disease in his sheep flock and in his family.[45] Overcoming the 'old brigade who consider that what is good enough for their fathers is good enough for them', was a challenge for another pair of students trying to educate some farmers.[46]

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the immunization against whooping cough carried out by the Medical School Health Clinic in Dunedin during 1944-6" (Unpublished Student diss., University of Otago, 1947).

[45] Cumming and Macgregor, "Epidemiology of hydatid disease."

[46] Alexander and Webber, "Hydatid disease in Hawkes Bay."

Hercus confronts claims for proprietary 'goitre cures' with assistance of his students

An unwelcome public response to Hercus's goitre research was the manufacture of locally-produced 'goitre cures' which Hercus and other members of the NZBMA sought to ban as early as 1927 through having a regulation added under The Sale of Food and drugs Act 1908. The government aimed the regulation at preventing misleading advertising but several manufacturers merely changed the wording of their promotional material while still making these products.

Two of Hercus's students undertook a study of two of these 'cures' to estimate the iodine content and compare the cost to the public of taking these pills and emulsions as iodine supplements with simply eating the oysters they derived from.[47] They were able to estimate (from the company's own figures) that capsules of Thyrodone, an oyster-derived product manufactured in Invercargill contained only 1.5µg (micrograms) of iodine or the equivalent of one fifth of an oyster. On the recommended dose of six capsules a day, a person would receive only 9µg of the estimated daily intake of 140µg. One dried oyster would fill five capsules, which meant that 'the patient is paying 6/- a dozen to have his oysters dried in order that they may be swallowed in the form of a pill.'[48]

The company making the oyster products, *Thyrodone Development Ltd.*, established in 1935 made several products from oysters harvested in Foveaux Strait,

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[47] A.D.G. Blanc and J. Paul, "A study of unorthodox medical treatment and the sale and promotion of proprietary medicines, therapeutic devices and cosmetics within New Zealand" (Unpublished Student diss. University of Otago, 1939).

[48] Ibid. 26.

including an emulsion and capsules, a ‘liquid concentrate’ and a dried product which it exported to some British breweries for incorporating into an oyster stout.[49] It was the success or otherwise of these exported products that featured in the company director’s annual reports and the locally promoted emulsion and capsules were rarely mentioned.[50] The advertising of these was likely to have infuriated Hercus when in 1937 an advertisement appeared in daily newspapers that inferred his endorsement of the product (and similar endorsements by Sir Arbuthnot Lane and Major Austin): ‘Prof. C.R. (sic) Hercus, M.D., D.S.O. (Professor of Bacteriology and Public Health, University of Otago, N.Z.) “Deficiency of iodine in soil and food supply is the basic cause of widespread endemic type of goitre occurring in well-marked areas.”’[51]

If Hercus did object formally to this it is unknown but the advertisement did not appear the following year, by which time Thyrodone was purported to be ‘indicated for’ a wide range of conditions that did not include goitre.[52] He did send at least one complaint to the Department of Health about purported goitre cures, but having his students discredit them by analysis was a practical solution that perhaps had an effect

[49] “Thyrodone Development Limited 1935-1953,” DAIM 9143 Box 31/g 186 R1027277. Archives New Zealand.

[50] The company folded in 1953 and was never very successful, despite having a large number of shareholders. The advent of the Second World War and the difficulties in marketing the products in Britain were offered as reasons for the poor profits being made.

[51] “Famous authorities and goitre,” *The Evening Post*, November 18, 1937: 22.

[52] “Thyrodone is life,” *The Evening Post* May 9, 1938, 17. These conditions included anaemia, debility, insomnia, obesity, brain fag, hardening of the arteries, blood pressure premature aging and others.

on sales of these products.[53] Blanc and Paul also investigated I-O-ZAN, another oyster product (with even less iodine) and Muir's Treatment, which turned out to be an old established treatment made by an Auckland manufacturer.

Albert Blanc's choice of unorthodox proprietary medicines for his dissertation may have led to his publishing a book a few years later focusing largely on quackery in New Zealand.[54] Blanc and Paul did not report if Hercus suggested the topic for their dissertation, but it could well have provided much needed confirmation for him of the uselessness of some of the purported goitre cures.

Hercus's students carrying out their practical surveys for their theses reported that they did at times inform the public not to use the 'so-called goitre remedies' and to take locally manufactured seameal products for endemic goitre.[55] At the height of Hercus's goitre studies in the 1930s, several students included 'goitre chapters' in which they surveyed the local inhabitants for goitre even if their prime object was a different topic.[56]

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[53] T. McKibbin to Director-General of Health, May 14, 1935. McKibbin passed on an observation by Hercus of an advertisement of a goitre remedy being sold in a Wellington pharmacy. ADBZ 16163 H1 1424/175/71 alt. no. 17200 (R20956907) Medical Advertisements – Quackery- Goitre Remedies, 1927-1937. Archives New Zealand.

[54] Albert D. G. Blanc, *Money, medicine and the masses* (Wellington: A.H. & A.W. Reed, 1949).

[55] J.N. Armour and J.L. McIvor, "An industrial treatise: alluvial gold mining in the Waikaia Valley from a public health point of view, with special reference to "King Solomon-Deep Lead Limited," and the rural hygiene of the district" (Unpublished Student diss., University of Otago, 1937); E.W. Duncan and T.W. Harrison, "A study of endemic goitre in the Cromwell District, Central Otago" (Unpublished Student diss., University of Otago, 1936).

[56] Ibid.

Former students report on their experiences

Not all students appreciated having to complete a dissertation in a year that was free of major examinations, a year described by one as 'an oasis in a desert of academic endeavour. … a year to take a breather and perhaps rediscover a little of the world that lay outside the immediate parameters of the syllabus.'[57] This discovery included one student's finding that not everyone had heard of 'medical students', when he attempted to survey the public on what they had stored in their medical cabinets.[58] The meagre contents are very revealing of the state of medicine in 1951. They also indicate that the introduction of free medicines through the Social Security measures brought in by the Labour government in the late 1930s had not assuaged the urge to purchase patent medicines, at least in the households surveyed by this student. 'Social Security apparently does not satisfy a public demand conditioned by many factors; by advertising, the half-truths of education, the instability of contemporary society and others', concluded Jackson, indicating the presence of 'Califig', 'Aspro' and unnamed proprietary tonics and cough mixtures ('of doubtful value') in the medicine cabinets.[59]

Some students interviewed for this thesis remember doing their dissertations with great affection and others can scarcely remember the event or even if they did one. Often, those who were keen participants showed originality in their choice of topics and those who were not keen, as Adams said: 'studied the water supply of

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[57] Parkes, *The fair beginning*, 70.

[58] W.B. Jackson, "A survey of the family medicine in three South Island homes" (Unpublished Student diss., University of Otago, 1951).

[59] Ibid.

Invercargill.'[60] In fact, a large number of students did study public health issues of their hometowns, leaving a useful record of the period, often including photographs.

Barbara Heslop remembers her dissertation on juvenile delinquency as being little more than an essay, but this was after a lifetime of investigating complex immunology.[61] Margaret Guthrie commented that her topic on menstruation in schoolgirls was a rare topic for study in 1949.[62] 'It was important for the students to go out and do these studies. There were few women to do them.'[63] Heslop and Guthrie said family or friends made their studies possible, Guthrie through her parent's friendship with a high school principal and Heslop through her father's connection with the Law Courts in Auckland.

Duncan Adams chose to study asthma having suffered badly from the condition from childhood at a time when there were no suitable treatments. He had entered Medical School with this aim in mind and the fifth-year thesis allowed him the perfect opportunity. 'I was curious about the pathogenesis of asthma. I tested whether asthmatics make higher antibody titres to typhoid vaccine than non-asthmatics. They don't.'[64] Adams subjected his fellow students to laboratory tests to prove his point. It was not uncommon for students to study their classmates for their dissertations.

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[60] Interview with Dr Duncan Adams, February 23, 2012.

[61] Interview with Dr Barbara Heslop, November 11, 2012.

[62] Interview with Dr Margaret Guthrie, May 9, 2011; Wray, M.W. "Some aspects of menstruation in fifth form girls at Otago Girls' High School" (Unpublished Student diss., University of Otago, 1949).

[63] Ibid.

[64] D.D. Adams, "Long-acting thyroid stimulator: how receptor autoimmunity was discovered," *Autoimmunity* 1 (1988): 5.

His dissertation caught Hercus's eye for its originality and Adam's ability to do carry out a research project competently. This led to his employment by Hercus as a researcher within the Medical School. Some students made their choices quite pragmatically – Brian McMahon studied the effect of physical exercises on obstetrics, with Professor Smithells at the School of Physical Education.[65] He chose the topic because he could see that obstetrics would be an important part of any general practice he took up. David Hay chose an immediate health issue that was causing concern through consulting the local Medical Officer of Health in Christchurch for an idea.

Because Hercus expected that students would carry out their projects over the long summer vacation, some students begrudged the loss of income from the casual work that they usually took up at that time.[66] Some studies reflect the work that the students were doing, with quite a number of industrial health surveys of freezing works, timber factories, brick manufacturers, wharves and wool stores in the 1940s. Such projects reflect the interest in improving industrial hygiene at this time. The Health Department was working its way to establish a Division of Industrial Hygiene in 1947.[67] New Zealand had 'entered an era of industrial activity, and although heavy industries such as steelmaking have not so far been established, there is clearly a

[65] Interview with Brigadier Dr Brian McMahon, May 18, 2011; McMahon, "A comparison of the attitudes towards and experience in childbirth.'

[66] Bill Parkes, *Fair beginning*, 70.

[67] Annual Report of the Director-General of Health, *AJHR* 1947, H-31, 41.

surprising diversity of light industry,' wrote Dr J. M. Davidson, an expert brought out to the country to advise the government.[68]

Presenting one's dissertation was an opportunity to shine in front of classmates and to impress Hercus, who read and commented on everyone's work but may not have given a grade. In only two of the approximately 60 dissertations that I have read, was there any correction by Hercus noted on the script. One of these related to a historical fact about poliomyelitis and the other to one of Hercus's recommendations for preventing hydatid disease that a student had misinterpreted. In the early years, it is likely that all the students presented their work to the class but by the 1950s only selected ones did so, possibly because of the increased class size.[69]

Richard Rawstron, who did present his work to the class, learnt a lot from completing his dissertation – not from the topic or what he found, but from undertaking the whole procedure: 'The idea was good for students to do research in that it made us get away from the books. We did a project, we talked about it and had to get up in front of the class and give a lecture. It was the execution that mattered'.[70] Rawstron appreciated that the process taught him to read academic papers critically and to design a 'tight programme' for his own future research into problems in anaesthesia. Hercus's student dissertation programme was an inspiration for Rawstron to institute similar research projects for house surgeons at Palmerston North Hospital's Department of Anaesthetics where he was Director. Another student

[68] Annual Report of the Director-General of Health, *AJHR* 1945 H-31 Appendix II, 20.

[69] Interview with Sir David Hay, June 19, 2013. Hay was not only chosen to present his work to the class but also to submit a paper on it to the *NZMJ*.

[70] Interview with Dr Richard Rawstron, June 11, 2013.

concurred with Rawstron's opinion writing, 'This paper may add nothing to the general knowledge, but the writer has learned much, both from the printed book and from contact with the public and for this alone the work has been more than worthwhile.'[71]

What effect did these theses have during Hercus's time at the School?

A number of the student studies gave Hercus invaluable information for his research areas, notably hydatid disease, endemic goitre and hay fever as well as infectious diseases, such as diphtheria, poliomyelitis and tuberculosis. Analysing the list of the dissertations that remain in the library's collection reveals the increasingly complex nature of medical research over the Hercus years. Students studied health aspects of towns, cities and Maori pas from Stewart Island to Dargaville and some offshore islands, mostly before 1938, and some more than once. More useful to medical historians, perhaps, are those studies with a more specialised aim, such as the incidence of infectious diseases, childhood disabilities and issue of public health in specific institutions, such as schools. At the time, they presented Hercus with a mass of information on the health of the nation, from which he could select data for his own use. As many of these studies involved assistance from officers of the Department of Health, it is likely that the students reported their findings and recommendations to these officers. In this way, the students' studies may have had an indirect effect on improving public health.

Hercus advised some students to publish the results of their studies in the *New Zealand Medical Journal* and then arranged for some of these to be reprinted in *The*

[71] Watson, "Goitre in Thames."

Proceedings. Sometimes these were presented collectively as “Studies in preventive hygiene from the Otago Medical School”, as occurred in 1925 with the publication of a study by E.F. D’Ath, K.R. Steenson and J.U. Williams on the complement fixation test for gonorrhoea, which was prefaced by Hercus.[72] The students carried out the work in the laboratory of the venereal diseases clinic of Dunedin Hospital. In his Preface, Hercus wrote that he proposed to ‘publish from time to time any of such investigations which may be of interest to the profession.’ It appears that this took until 1951 for another to publication under this title, though some student papers appeared singly in the interim.[73] Also in 1951, student D.S. Mckenzie’s paper on “The incidence of retinitis pigmentosa in one family,” appeared in a *Supplement* to *The New Zealand Medical Journal*.[74] The final edition of *The Proceedings* in its original format carried two student papers: David Hay’s rubella study and a paper by J.D.K. North and J.W. Saunders on muscle spasm in poliomyelitis.[75] The Department of Health published a condensed version of Hay’s paper in its *Health* journal, and he gave several public and professional presentations of his results, gaining him experience with public speaking and dealing with the media.[76] For Hay, his study was

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[72] Hercus, preface to “Studies from the Department of Preventive Medicine,” 27.

[73] R.W. Hornabrook, “The katipo spider,” *NZMJ* 50 (1951): 131-38.

[74] D.S. McKenzie, “The inheritance of retinitis pigmentosa in one family,” *NMZJ Suppl*. 50 (1951): 79-82. Hercus kept a copy of this paper but the original dissertation is not included in the collection.

[75] D.R. Hay, “The relation of maternal rubella to congenital deafness and other abnormalities in New Zealand,” *NZMJ* 48 (1949): 604-8; J.D.K. North and J.W. Saunders, “A clinical and electromyographic study of muscle spasm occurring in poliomyelitis,” *NZMJ* 48 (1949): 603-13.

[76] Sir David Hay, *Heart sounds* (Wellington: Steele Roberts Ltd., 2005); 54; D.R. Hay, “Congenital deafness in children,” *Health* 5 (1953): 9-10.

to help him get the best positions at London Hospitals and indirectly enhancing the reputation of the School. Hay also addressed medical meetings in New Zealand to explain his findings.

Hercus also presented students' work on a cancer review at the Dunedin Hospital carried out by six pairs of students who collected and collated cancer statistics over the years 1926 to 1931.[77] He acknowledged their help in the introduction to the paper. In 1951 another student dissertation appeared in *The New Zealand Medical Journal* – an investigation into 'Stitch: the side pain of athletes' by J.D. Sinclair, who had interviewed a number of athletes on their experiences of the condition and offered suggestions on how to avoid it.[78]

Goodall's 1958 study into the emerging field of genetic linkage and heritable diseases, after some further study led to its publication in the *Annals of Human Genetics*. This was one of the top journals of scientific genetics in 1963.[79] He explained how he began his study:

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[77] C.E. Hercus, R.D. Keenan and H.D. Purves, "Collective investigation into cancer from the public health aspect," *NZMJ* 32 (1933), reprinted in *The Proceedings of the Otago Medical School*, 1936, unpaginated.

[78] J.D. Sinclair, "Stitch: the side pain of athletes," *NZMJ* 50 (1951): 607-12.

[79] C.M. Goodall, "Nail-patella syndrome coupled with blood group B in a New Zealand family," *Annals of Human Genetics, London* 26 (1963): 243-44; C.M. Goodall, "Two studies in genetics: (1) Blood groups and schizophrenia: an experiment to test for association; (2) Onchyodystrophy with emerging nail-patella syndrome and a pedigree showing dissociation" (Unpublished Student diss., University of Otago, 1958).

> [As a student] … I saw a case of *Nail Patella Syndrome* in a clinic and followed it up with help from dermatologist Hugh Stringer. … I continued to work on the study after handing it in and found out how to analyse the information about linkage with the ABO locus, which was the focus of the published report.' At the time, it was the only autosomal linkage that had been found in New Zealand.[80]

Goodall's paper is still being cited today. He attributes his choice of the second part of his thesis to following the 'advice' quoted on the wall of the Hercus Building: 'Observe, Remember, Compare,' (John Hunter, 1728-1793) in that he had noted the unusual nail condition and sought to investigate it.[81]

How did Hercus promote medical research to his students?

Hercus shared his passion for learning with his students, endeavouring to pass on the latest research findings in his lectures, no doubt hoping that some might share his interest. One of the most enduring memories of Hercus's lectures is that of his invariably carrying a pile of 'five or six' books into the lecture theatre.[82] Whether he consulted these consistently is debatable, but they were a prop to his informing the students of the most up-to-date research findings in Public Health or Bacteriology. Heslop does not remember Hercus opening any of the books that 'seemed as much a

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[80] Interview with Dr Maarire Goodall, August 12 and 23, 2013.

[81] John Borrie, *Art and observables in the Otago Medical School* (Dunedin: University of Otago Medical School, 1975), 14.

[82] Interview with Dr Barbara Heslop, November 12, 2012.

part of him as was his clothing.'[83] It would appear that these books were a prompt for his talks even outside student lectures: in an address to the Fourth Annual conference of The New Zealand Branch of The Royal Sanitary Institute, he introduced the audience to four of his favourite books on public health including George Newman's *The rise of preventive medicine*.[84]

Adams believed the books contained things Hercus had read and he wanted to talk about, but he often had not had time to do so and 'waffled.'[85] Hercus 'was a very good off-the-cuff speaker, however. They were most unusual lectures,' said Adams. Not all students enjoyed these lectures, claiming they were dull, but my interviewees remember some of his profound wisdoms about life and learning:

> Hercus used to keep saying that we were students of something or other, and we used to write down what we were students of, because every day we were students of something different. We had an enormous list at the end of the course. He did tell us we would be students for all of our lifetimes, which was of course correct. People now say that this is the modern educational approach, and that we must learn to be students for the whole of life. There is nothing new about that – we were brought up on it.[86]

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[83] Ibid.

[84] C.E. Hercus, "Various aspects of the teaching of public health," *Journal of the New Zealand Branch of The Royal Sanitary Institute,* 4 (1938): 128-9.

[85] Interview with Dr Duncan Adams, February 23, 2012.

[86] Interview with Dr Barbara Heslop, November 12, 2012.

No doubt a good deal of the success of the dissertations was down to Hercus'smuch-commented upon immense capacity for work and his passion for research. 'He picked on anything that people were suffering from. If he saw a disease that didn't have a cure, he wanted to do research into it and find out how to fix it or get rid of it,' said Adams. The evolution of the topics chosen by the students reflect the health issues of the time, such that as infectious diseases waxed and waned, there was inevitably a student project studying some aspect of it. In this way, there was up-to-date information collected on the incidence of leptospirosis, brucellosis and bovine tuberculosis, as well as poliomyelitis and scarlet fever.

Former students report that Hercus was very approachable, kind and willing to offer assistance. The female students appreciated his caring attitude, which they found was exceptional among the male staff members at the time. He brought the students along on the quest to improve public health through research, if they wished it and in this way enhanced the reputation of the School and its record of medical research.

Sensitive subjects: theses on psychiatric patients and on Maori health

In the case of sensitive dissertations, Hercus allowed an exception to not present to the class, such as he made for Golan Maaka and his 1931 public health study of Ratana Pa:

> Golan perceived a difficulty [in presenting to the class and] asked his supervisors for a private audience and not to have his thesis published or read

publicly as it might have repercussions on him and his tribe from the people of Ratana. The medical faculty agreed.[87]

Barbara Brookes reports that two more students studied the Maori community at Ratana in 1940 and found that the community had erected a large communal building, part of which was being used as a picture theatre.[88] This kind of facility was to prove useful for the Department of Health's drive to educate Maori about the prevention of tuberculosis through the medium of film.

When looked at today, some of the Maori studies contain remarkably insensitive remarks made by the students after examining the living conditions and health of Maori in a wide range of pa sites throughout the country. Criticism of poor housing and living conditions was not restricted to Maori, however, the students reported many New Zealanders of European descent lived in poor conditions, which they believed contributed to illness throughout the country.

There were very few Maori medical students at the School and some of these such as Maaka (as above) and Peter Tapsell in 1953 chose to study aspects of the health and environment of Maori. The Maori students often appeared to be just as critical of Maori housing standards as their fellow students. Some of the studies focused on certain diseases known to be rife among Maori, such as tuberculosis, but most were

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[87] Bradford Haami, *Dr Golan Maaka, Maori doctor* (Birkenhead: Tandem Press, 1995), 81.

[88] Barbara Brookes, "Health Education Film and the Maori: Tuberculosis and the Maori People of the Wairoa District (1952)," *Health and History,* 8 (2006) no.2: 51. The dissertation by J.P. Broad and J.S. Steven does not appear to be in the Dissertation Collection at the School.

more general, focusing on aspects related to Hercus's Preventive Medicine course. Goodall reported:

> There was only one other Maori student in my class. There was a Samoan in the next year and we had Dr Williams who became head of the Cook Islands' Government. We had tutorials from Henry Bennett and Peter Tapsell who were a few years ahead of us. We did not talk about it and my friend did not find out about [my Maori ancestry] until later class reunions.[89]

The School's Public Health course included 'environmental problems' which related to town-planning and housing, the relation to housing and disease and mortality, and the criteria of a healthy dwelling, lighting, heating, ventilation and drainage. Also included were a study of water supply and the need to acquire an understanding of public health sanitation laws

The majority of the Maori studies were by European New Zealanders curious to examine the living conditions of these seemingly exotic people. Graham Cowie wrote that he was inspired to study the Wairarapa Maori after reading his father's MD thesis on the same topic many years before.[90] Keen to use his newly acquired knowledge of the Maori language and interest in the Maori of the King Country, T.C. Trott

[89] Interview with Dr Maarire Goodall, August 10 and 23, 2013.

[90] Graham Cowie, *The life and times of a G.P.* (Waikanae: The Heritage Press, 1989): 55-6.

investigated the relationship between housing and health of these people with the aim of helping 'the Maori to become more useful citizen of New Zealand.'[91]

Brunton writes that the publication of one thesis with a Maori theme was problematic for Hercus, who 'conscious of the limitations of what was, after all, only undergraduate work, kept a tight rein on publication and few publications resulted.'[92] In 1941, a student identified by Brunton as C. Swanston published a paper based on his study *Trachoma in the Maori* in *The New Zealand Medical Journal,* without permission.[93] Brunton writes that this caused 'serious trouble' by criticising a government department.'[94] Swanston had visited several schools in the top of the North Island with a School Medical Officer examining the children for trachoma. He also visited some Maori family homes of which he was very critical. He criticised the health care that the Department of Health offered Maori in remote locations and not

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[91] T.C. Trott, "The Maoris of the Northern King Country: the relationship of housing to health" (Unpublished Student diss., University of Otago, 1940).

[92] Brunton, *Medicine of the future*, 75; Dean to Alexander, December 15, 1941. ARC-0913 94-121 File 53 1941; W.S. Alexander to Dr Hercus, December 11, 1941, ARC-0913 94-121 File 53 1941. The criticism is included in Hercus's letter to student William Stewart Alexander who had written to get belated permission to copy and distribute his own dissertation to members of a Parliamentary Select Committee before they met officially to discuss land development in an area that he had just studied. He claimed that he had mentioned he might take this course of action when he had presented his thesis which was a medico-social survey of the Waikite Valley land development block near Rotorua. Hercus wrote that he was pleased to see that his 'thesis has so quickly borne practical fruit' and did not believe that it could do anything but good.'

[93] C. Swanston, "Trachoma in the Maori," *NZMJ* 40 (1941): 287-98; C. Swanston, "Trachoma in the Maori" (Unpublished Student diss., University of Otago, 1940).

[94] Brunton, *Medicine of the future*, 266.

seeing Maori patients with trachoma (including adults) early enough to prevent blindness.

Theses on the management of mental illness were not common although medical students visited Seacliff Mental Hospital to observe patient care.[95] From as early as 1937, Hercus was interested in the prevention of mental disease and believed that because of New Zealand's small and homogeneous population it offered a 'peculiarly favourable field for research, particularly on the genetic side.'[96] Nevertheless, because there was no properly endowed Department of Psychiatry, 'no progress can be expected,' he wrote in 1937. He encouraged Goodall to pursue a study of a linkage between an identifiable genetic blood marker and schizophrenia in patients at Seacliff Mental Hospital, despite Goodall's reluctance after finding a lack of a consistent diagnosis of the condition in the 1950s. The study gave Hercus an insight into the treatment and care of the patients but afforded no breakthrough for Goodall who could not find an association between blood groups and schizophrenia.

Sharing the student dissertations

Hercus shared the results of some of the student theses to support talks that he gave to different groups and may have passed on the findings of one study to Dr H.B. Turbott, Deputy Director of Health in 1958. Turbott included details of the students' analysis

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[95] Interview with Dr Barbara Heslop, November 11, 2012. Heslop remembers visiting on two successive days where the class was 'escorted around various different patients … for whom there was nothing anyone could do.' The atmosphere in the 'big baronial castle' was depressing for the students so it was unlikely that many would choose to study in this establishment.

[96] Hercus to Chapman, October 16, 1937. ARC-0913 24-121-42 (1937).

of eye injuries treated at Dunedin Public Hospital in a radio broadcast and later in print in the Department's *Health* journal but did not name the students.[97] He used their work to issue a warning about the increasing trend of eye injuries occurring in homes. Hercus addressed meetings of The New Zealand Branch of the Royal Sanitary Institute when it held its conferences in Dunedin on two occasions. He reminded delegates of the important work done by pioneer doctors in improving the health of New Zealanders.[98] He derived a good deal of the information for both addresses from a student thesis completed several years before by Eric Elder and acknowledged this assistance in each address. He emphasised the great strides that had been made since the mid-nineteenth century and urged the audience to use the weapons of warfare available to them and to himself of 'education, organisation, and, most importantly, co-operation.'

After Hercus's time, the dissertations continue to be a rich source of material for medical historians. As mentioned in the Introduction to this thesis, Tennant accessed a 'cluster' of dissertations carried out at the height of interest in the Health Camp

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[97] H.B. Turbott, "Eye accidents," *Health* 10 (1958): 16. It is likely that the thesis mentioned was "Eye injuries: a study of eye injuries requiring admission to the Dunedin Public Hospital, 1952-1956," by A. Imo and G.A. Schuster in 1957 (Unpublished Student diss., University of Otago, 1957).

[98] Hercus, "Various aspects of the teaching of public health," 128-9; Charles Hercus, "Some notes on public health in Otago from 1848-1876," *Journal of the New Zealand Branch of the Royal Sanitary Institute* 8 (1948): The student thesis he quoted from is no longer in the Collection but was completed by Eric Elder in 1935.

movement in New Zealand.[99] She referred to four of these undertaken in the summer of 1937-8 just prior to the federation of the camps under the 1938 King George V Memorial Fund Act.[100] Public fervour for setting up the camps was at its height that year as the government appealed to the public to help fund the cause. This may explain the number of dissertations on the subject – there are at least six between the years 1937 and 1939 in the collection, and three between 1942 and 1947 that investigate two of the newly established permanent camps. In the first six of these studies, the students acknowledge Hercus's assistance in writing their studies, criticising their texts and the best way to present their findings.[101] Some write that

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[99] The dissertations carried out on the Health Camp movement in 1938 were: B.W. Rutherfurd, "Health Camp Waikouaiti, January 1938" (Unpublished Student diss., University of Otago, 1938); J.W. Avery and J.K. Michelle, "A public health survey of the Central Mission health Camp held at Company Bay, Dunedin, December 27th–January 31st 1938" (Unpublished Student diss., University of Otago, 1938); Alexander W.H. Borrie and Percival C. Service, "A survey of the children and their environment at Nelson Children's Health Camp" (Unpublished Student diss., University of Otago, 1938); and J.J. Bourke and A.E. Berenstrom, "Evaluation of a children's health camp, Otaki" (Unpublished Student diss., University of Otago, 1938) (not mentioned by Tennant). There was also an earlier one by H.M. Foreman and B.M. Hay, "A general survey of the Auckland Children's Camp"(Unpublished Student diss., University of Otago,1937), and one in 1939, by G.H. Stewart and B.W. Clouston, "The need for a health camp in Marlborough and a discussion of the 1939 camp" (Unpublished Student diss., University of Otago, 1939). See [List of] Department of Preventive Medicine 5th year Dissertations, n.d., held in the Historical Collection, University of Otago Medical Library; Rawstron and Jefferson, "The effect of environment on the child." These men studied children at a health camp for their dissertation in 1940.

[100] 1938 King George V Memorial Fund Act.

[101] My thanks are due to Richard German, Librarian at the Medical School Library for providing details of the 'Acknowledgements' in these six student dissertations, November 4, 2013.

Hercus guided them on the type of material to choose, indicating that he was closely involved and interested in the topic.

It is beyond the scope of this thesis to elaborate on the dissertations using Tennant’s analysis, except to indicate some of the questions that at least one student set out to answer in his work. These include finding the scientific basis of the claims to success, what value the camps were to improving the health of children over the arguably short period of two to four weeks the camps ran, and looking for bias in the way the organisers selected children to attend. Tennant claims the student reports, although they were critical of the system then in place, ultimately had no effect. Whether Hercus shared these reports outside of the School is not clear, and with the loss or amalgamation of the voluntary camps happening so soon, it is a moot question whether this was the aim of the cluster of student theses on the Health Camp movement.

Conclusion

The preventive medicine dissertations were a great innovation that inspired students to carry out their own research over a wide range of topics. The result is a collection of work on the social history of New Zealand from a public health point of view. Hercus’s powerful personality ensured that the students knew what they had to do – ‘by osmosis’, said Goodall. ‘Sir Charles expected people to behave nobly as he did, and we knew we were responsible for ourselves and what we did.’ Part of his ‘huge agenda to improve the world’ was for students to experience researching a medical subject that could result in some small way to benefit the population. Hercus ensured the success of many of the student projects by offering help in the form of suggestions as well as giving his own practical assistance. Some of the students went on to careers in medical research, testament to their exposure to research in their fifth year.

Preparing these theses provided students with their first experience in scientific writing, learning how to read and evaluate scientific journal articles and to present their projects to an audience of their peers. Not all students did have the chance to present their work, however, probably due to the increase in class size in the early 1950s. For some students carrying out their dissertations inspired their choice of career, while for others they had little impact.

A final quote from Drennan in 1935, by now Professor of Pathology in Edinburgh, confirms the uniqueness of the project:

> The studies in preventive medicine, so well-known to medical students at Otago are unique. I know of no other medical school that attempts, far less produces such work. In the files of the Preventive Medicine Department are the consecutive records on many subjects that are of the utmost value and worthy of a vastly wider publicity than that of the drawers they perforce lie in.[102]

Drennan, former professor at the School and a great favourite with students and staff, had been visiting in 1935 when interviewed for the *Digest*.[103] He had been one of the

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[102] Drennan, "Reunion," 22-5.

[103] The *Digest* was the School's student magazine: C.E. Hercus, "The coming of age of Digest," *Digest* 4 (1954) no.3: 5-8. Hercus contributed this on the magazine's 21st anniversary. In it he presented a brief history of the School and on the contribution it was making to the community and by outstanding graduates now in other countries.

earliest doctors to notice the high incidence of endemic goitre among the New Zealand population and to bring it to the notice of the public. The subject of the following chapter is Hercus's role in investigating endemic goitre and ultimately bringing it under control through iodine prophylaxis.

Chapter Four: Conquering endemic goitre 1920-1937

The whole goitre question is full of interest and full of difficulties.—F.S. Batchelor, 1935[1]

Introduction

The 1920s and 30s in New Zealand were a time of economic uncertainty, variously referred to as a 'roller coaster of depression, booms and disease', a period of 'confused politics' and government cost-cutting measures.[2] Fluctuating commodity prices added to the uncertainty. The increasing movement of people from rural areas into towns and cities caused poor housing conditions to arise and consequent ill health as poverty escalated with the approaching depression years of the early 1930s. The restructuring of the Department of Health in 1920 brought school medical officers into the Division of School Hygiene from their former position with the Department of Education and an expansion of their role to include 'special inquiries into the many problems of disease and inefficiency in relation to the school-child.'[3]

This recognition of the need to investigate the reasons of ill-health in the country's children brought about Hercus's first foray into medical research in association with School Medical Officer, Eleanor Baker. He saw that New Zealand had a problem with endemic goitre and took up the challenge as early as 1921 to rid the country of it. It

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[1] F.S. Batchelor, "Goitre. A review of the work at the Dunedin Hospital Goitre Clinic," *NZMJ* 34 (1935):147.

[2] Wright, *Illustrated history of New Zealand*, 251; Brooking and Enright, *Milestones*, 149.

[3] Report of the Director-General of Health, *AJHR* 1920-21, H-31, 29.

took more than 20 years to achieve this through the introduction of iodised salt at the necessary concentration. This chapter explains the wide-ranging experiments he co-ordinated to solve the situation and the involvement of other research groups. His goitre investigations illustrate many of Hercus's leadership skills, his ability to publicise the important findings of the work and his building up of a network of researchers, not the least of which were many of his fifth-year students who provided vital survey results for him. The chapter ends in 1937, a crucial date for Hercus when he helped set up the MRC as a Committee of the Department of Health, and when he was appointed Dean of the School. By this date, the Labour Party had come to power and was beginning to transform the state into the 'Welfare State', with important implications for public health.

Endemic goitre studies begin

An oft-quoted statement about how Hercus focused on preventing endemic goitre is that after five years' absence from New Zealand on military service he was amazed at the extent of the goitre problem he saw in Christchurch.[4] Professor of Pathology at the Medical School, Murray Drennan had observed a similar occurrence among women in Dunedin in 1919 when he first arrived in the country and declared that 'It ought to be the centre of original investigation into the particular N. Z. problems of health and

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[4] Hercus, Benson and Carter, "Endemic goitre", 322.

disease.'[5] Hercus and Drennan later became colleagues in the School and Drennan he wrote a thesis on goitre for his MD degree in 1924.[6]

Endemic or simple goitre is caused by a swelling of the thyroid gland, which sits in the front of the neck and has two lobes connected by a narrow band lying across the windpipe. The lobes are the size and shape of a Brazil nut and have an extensive blood supply, which is indicative of its important function in the body. The gland varies in size according to age, reaching its maximum at puberty and slowly decreasing after age 30. In giving the prestigious Cawthron Lecture in 1929, Hercus described the functions of the gland as 'numerous and of primary importance to the health of the body.'[7] If the thyroid is underactive, it prevents growth and intellectual development, and at worst causes cretinism. One of the consequences of an underactive thyroid is a slowing of the metabolic rate and myxodoema. Conversely, an overactive thyroid produces increased metabolic rate and exophthalmia.

In 1920, no authority collected statistics on the incidence of goitre except as a cause of death or treatment in public hospitals. Dr Michael Watt, Deputy Director of Health produced some statistics for Hercus in 1927, which indicated an increasing

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[5] Murray Drennan, "The prevalence of goitre in New Zealand and its influence on the coming generation," *Kai Tiaki* 12 (1919):112-13.

[6] Hercus used Drennan's 1924 MD thesis 'Studies on goitre in New Zealand' as a reference for his later work.

[7] C.E. Hercus, "Goitre in the light of recent research" Cawthron Lecture (Nelson, The Cawthron Institute, 1929), 5.

incidence since 1916, especially in females.[8] There was no age-breakdown of the statistics so it is not possible to know if these included children.

Goitre appeared to be an inherited condition, increasing in the Canterbury and West Coast region with each generation and considered to be dangerous during birth.[9] Teachers complained that goitrous children were slow to learn and were ‘dull’. The situation was not as bad as that in Switzerland where cretinism was common but people feared that it could progress to that state. The situation in the Maori population was less serious but inland groups with no access to the sea did suffer from goitre.[10]

As an Army doctor, Hercus helped examine recruits for a short while before departing with the Main Body in 1914. He does not mention rejecting recruits specifically for goitre, but in 1920, he consulted the Army’s statistics of rejections and found that 1,581 men out of 135,282 men examined between 1914 and 1918 failed because of thyroid enlargement.[11] Sixty-three per cent of those rejected came from Canterbury.

Hercus and Eleanor Baker co-operate to investigate goitre in Canterbury

Hercus wrote in 1929 that ‘In 1920, with the assistance of Dr Eleanor Baker of Christchurch I carried out observations of the thyroid gland of 15,000 school children

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[8] C.E. Hercus, “The incidence, aetiology and prevention of goitre in New Zealand,” *Supplement. Medical Journal of Australia* 2 (1927): 3-23.

[9] C.E. Hercus and E.S. Baker, “Further consideration of endemic goitre, Part I,” *NZMJ* 22 (1923): 88.

[10] Hercus, Benson and Carter, “Endemic goitre,” 6.

[11] Hercus and Baker “Statistical study,” 116.

in Canterbury and Westland.'[12] It would appear from this statement that he initiated this research project. There is no mention in any of these early papers of how this work was funded, and presumably, the Department of Health financed it.

Hercus and Baker designed their survey using information published by American pathologist David Marine on goitre in farm animals and schoolchildren in Ohio in 1919.[13] Working with O.P. Kimball, Marine examined nearly 4,000 schoolchildren using standard criteria that defined the goitres according to size. Kimball and Marine showed that they could achieve prophylaxis by using sodium iodide supplements in these children. Hercus adopted the same criteria but added one more category to include an initial very slight enlargement that eventually proved to be abnormal. Both Marine and Hercus noted any goitres that were adenomatous (having nodular encapsulated tumours), but these were very rare.

As already mentioned, Hercus and Baker examined nearly 15,000 children in Canterbury and Westland, of both sexes aged between five and 18 years, while Marine and Kimball examined only girls (because they were twice as likely to have goitre as boys were), aged between about 10 and 15 years. Hercus and Baker determined that the problem was widespread and there was a 'high incidence of goitre throughout the section of the population examined', and this constituted 'a public health problem of considerable magnitude.'[14] Up to 90 percent of the children in some schools showed signs of goitre, though only 40 percent of children in Heathcote did.

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[12] Hercus, "Cawthron Lecture," 11.

[13] O.P. Kimball, J.M. Rogoff and David Marine, "The prevention of simple goiter in man," *JAMA* 73 (1919): 1873-74.

[14] Hercus and Baker, 'Statistical study", 121.

At this time, the causes of goitre were uncertain but Hercus suspected that the lower incidence of goitre seen in areas of Christchurch supplied with water slightly contaminated with seawater, such as Heathcote and Lyttelton, indicated that goitre might be related to the water supply. Hercus and Baker sent out a circular to parents in 1921, quoting the successful American experiment, asking for information on the children and requesting permission to treat them with iodised salt. There being no iodised salt commercially available in New Zealand, Hercus and Baker added sodium iodide to salt and then gave it to the children as a solution in water. This was difficult to manage and they then turned to using tabloids containing 1 grain of potassium iodide. Teaching staff administered these weekly. From 1921 to 1926, the School Medical Service provided free tabloids of potassium iodide (0.065g) to children in endemic areas of New Zealand.[15] The scheme ceased once salt became iodised but it had good success prophylactically and therapeutically and drew the attention of the public. Funding for the New Zealand trials was from a Department of Health grant, the first of many that Hercus obtained over time.

As in America, many parents refused permission for their children to take part and the researchers allocated their children as ‘controls’. This resulted in an imbalance in numbers and possibly skewed the results. In New Zealand, more parents relented with time and the numbers treated increased. Hercus wrote: ‘In 1921 rather less than half the parents were willing that their children should receive the treatment. In 1922 two-thirds of the parents consented, and a number of children had joined the schools for

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[15] Hercus and Purves, “Studies on endemic and experimental goitre,” 189.

the purposes of obtaining the treatment.'[16] Some parents were still objecting to even having their children examined in 1924, let alone taking part in prophylaxis experiments, as two anonymous letters to the editor of *The Evening Post* attest:

> I would like to call the attention of parents and other good citizens to the fact that our State Schools are meant essentially and exclusively for education, and not as a medium for propaganda, medical or otherwise … the effects of the methods [of medical examination] are to cause constant fear, this fear inviting or even producing the very condition wanted to be avoided.[17]

The parent of another pupil agreed, saying that a school medical officer had caused great alarm in his daughter by telling her she had goitre.[18] 'What does goitre do to you?' asked the child. The examinations caused some strange behaviour in the school with the children examining one another's necks to see if the swelling was 'getting larger – not smaller, mark you … surely that is the wrong thought to install in young minds,' wrote the correspondent.[19]

Judging by today's standards of randomised, double-blinded, controlled trials, these experiments were not of very high standard but contemporary researchers held

[16] C.E. Hercus, and E.S. Baker, "Further consideration of endemic goitre, Part II" *NZMJ* 22 (1923): 169.

[17] "Medical Inspection of children," *The Evening Post*, June 26, 1924, 3.

[18] "Medical Inspection of children," *The Evening Post*, June 28, 1924, 6.

[19] Ibid.

them in high regard.[20] Hercus and Baker claimed that they took care to exclude bias 'In assessment we did not know and took pains not to know, which children had been taking treatment and which had not.'[21] It is unclear how much practical help Hercus gave to this project and it is likely that Baker carried out most of the examinations.

Investigating McCarrison's theories

In the early 1920s, theories of the causes of endemic goitre were many and varied – no one knew for sure but some such as those of Colonel Robert McCarrison perplexed Hercus with his articles in *The British Medical Journal*.[22] McCarrison had worked in Himalayan India and later in the University of Oxford's Department of Physiology. He claimed that there was a range of causes of endemic goitre including improper and defective food supply, overcrowding and defective air space, close and continued contact with infected soil (particularly damp soil), hard water and pollution of food and water by faecal excrement. An excess of fat in the diet could cause a hypothetical 'fat-thyroid-iodine' balance that interfered with iodine uptake, and he claimed to have shown this in experiments with pigeons. Bacteria in the gut could cause a similar effect. Feeding pregnant laboratory animals with cultures of faecal bacteria collected from goitrous persons produced goitrous young. He concluded that bacteria in the gut were hampering the absorption or utilisation of iodine.

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[20] Anon., "Iodine prophylaxis and goitre," *BMJ* 1 (1925): 321. This writer commented: 'This admirable piece of adequately controlled work by Hercus and Barker (sic) is one that should be repeated by skilled observers in a number of selected schools in this country before any further attempt is made to introduce a generalized system of iodine prophylaxis.'

[21] Hercus and Baker, "Further consideration II," 170.

[22] Robert McCarrison, "Fats in relation to the genesis of goitre," *BMJ* 1 (1922): 178-81.

Hercus and Baker thoroughly researched the current theories on the causes of goitre, including those of McCarrison, and they published their analysis in April 1923 before the second paper of their survey results appeared.[23] Hercus and Baker agreed with McCarrison that in some cases enlarged goitres were the result of infections, but did not believe that 'all endemic goitre is due to a specific virus.'[24] Apart from moderately hard water and damp soil in midwinter, they did not find the factors in Canterbury, where goitre was most prevalent, that McCarrison believed caused goitre.[25] Other workers suggested that radioactivity in the water supply caused goitre – levels were high in Switzerland where goitre was endemic.[26] There was evidence that Christchurch's artesian water supply had 'a radium emanation far above the ordinary' – 10-20 times that of other New Zealand samples, although the figures were comparable with well-known European springs.[27] In 1909, the Canterbury Philosophical Institute had set up a committee to examine why artesian water was

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[23] Hercus and Baker, "Further consideration I," 79-89.

[24] Ibid., 80.

[25] Anon., "The Berne International Conference on Goitre," *BMJ* 2 (1927): 504-5. McCarrison still claimed a pathogenic organism was responsible for endemic goitre at the conference.

[26] Hercus and Baker, "Further consideration I," 81.

[27] C. Coleridge Farr, and D.C.H. Florance, "On the radio-activity of the artesian-water system of Christchurch, New Zealand, and the evidence of its effect on fish-life," *Transactions and Proceedings of the Royal Society of New Zealand* 42 (1909): 185-90; M.N. Rogers, 'An examination of the radon and iodine content of certain Christchurch artesian waters, with respect to the incidence of goitre," *Transactions and Proceedings of the Royal Society of New Zealand* 57 (1927): 893-9. This later study failed to find any relationship between radium emanation in certain areas of Christchurch and numbers of people with goitre. There was no radium emanation in the waters of Timaru but there was goitre.

killing young trout with a goitre-like condition in hatcheries on Christchurch's rivers. Researchers found that as long as the water ran along open channels, the fish survived. Whether that was because the free-running water dispersed the radioactivity or because of increased oxygen levels, it was hard to say.

Dr Colquhoun referenced Farr's early study but Hercus does not refer to Colquhoun's work, choosing to use Farr's original papers.[28] Colquhoun pointed out that the symptoms in the fish were not those found in human endemic goitre but were more like those of active goitre and even then were not similar in other respects.[29] The 'pop-eye' condition that the fish developed was not the same as that in exophthalmos, being caused by gas collecting behind the eye. Hercus and Baker dismissed radioactivity as a cause of human goitre – after all, it rapidly dissipated on standing, rippling or boiling – and there were just as many cases of goitre in Timaru, which obtained its water from the Pareora River after being run in an open race for many miles.[30]

In the early twentieth century, there was 'a widespread belief, held by the medical profession as well as by the public that by simply boiling drinking water a person entering an endemic area could secure immunity.'[31] Boiling drinking water presumably precipitated the calcium and magnesium salts that some people thought

[28] Daniel Colquhoun, "On goitre," *NZMJ* 8 (1910): 17-71; Farr and Florance, "Radio-activity of the artesian-water system," 185-190; C. Coleridge Farr and D.B. Macleod, "On some further experiments on the effects of artesian waters on the hatching of trout," *Transactions and Proceedings of the Royal Society of New Zealand* 43 (1910): 47.

[29] Colquhoun, "On goitre," 23-4.

[30] Hercus and Baker, "Further consideration I," 82.

[31] Ibid.

caused goitre and destroyed any infecting micro-oganisms believed by other authorities to be the cause. Hercus and Baker said however, that these factors could not be the cause of goitre in New Zealand where most cases occurred in women, a large number of whom 'take nearly all their water in the form of tea, and all water used in cooking is boiled.'[32] Hercus and Baker surveyed the sources of drinking water in Canterbury and Westland schools and domestic supplies but found no striking differences in the incidence of goitre related to different sources.

Hercus co-ordinates a New Zealand-wide study

Still working on the hypothesis that the drinking water supply caused goitre in some way, Hercus consulted geologists, Professor Noel Benson, of Otago University and Professor Robert Speight of Canterbury College.[33] Some American writers had identified water supplies from certain rock types were associated with goitre and others only rarely: could this be applicable to New Zealand? In Britain, there was an increased incidence of goitre in the limestone areas in Derbyshire giving rise to a condition known as 'Derbyshire neck.' This was the starting point for Hercus's much-acclaimed major research paper researched and written in conjunction with University of Otago's Professor Noel Benson of the Geology Department and Dr Charles Carter of the Chemistry Department. The aim was to correlate endemic goitre with the iodine content of New Zealand soils and spring waters.[34] Hercus sought to prove that environmental factors were acting to deplete iodine in the soils and thereby restricting

[32] Ibid.

[33] Ibid., 83.

[34] Hercus, Benson and Carter, "Endemic goitre," 321-402.

the iodine content of foodstuffs grown on them. The task would involve geological mapping of the whole country and correlating the rock types with the iodine in soils derived from them.

In the early1920s, endemic goitre was uncommon in many countries so there was little need or interest in analysing soils or foodstuffs for iodine. Iodine is a trace element in soils and is not essential for the growth of higher plants but it is essential for animals. Even today, iodine rarely rates a mention in soil chemistry textbooks, which concentrate on deficiencies of more important trace elements such as cobalt. Because of the apparent unimportance of measuring soil iodine, there were inadequate laboratory tests available for Hercus and his co-workers to use to measure iodine levels in soils, foods or bodily fluids such as blood or urine.

Hercus collected a wide range of helpers to carry out his ambitious project. In addition to Benson and Carter's assistance, several of his fifth-year Preventive Medicine students, research scholars and university staff helped. [35] Even Hercus's wife worked on part of the project. He also arranged for officers of the School Medical Service to examine schoolchildren for goitre. These officers performed over 80,000 examinations of schoolchildren for goitre as well as collecting soil and water samples for analysis. Hercus persuaded the government give £200 to fund the work.[36] As documented earlier, Hercus ventured into the remote Urewera Country of the North Island partly to follow up reports by Dr Mecredy of the Health Department that he had found many cases of goitre amongst local children. Hercus examined 300

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[35] Ibid., 86-87. These included Professor of Chemistry Dr Inglis and Professor Rawson from the Department of Home Science of the University of Otago.

[36] Ibid., 323.

people for goitre and found 18 percent of the whole population affected and 30 percent of the children.[37]

Published in 1925, the resulting paper ran to more than 80 pages in *The Journal of Hygiene*, the three men writing sections related to their area of expertise and concluded by Hercus.[38] Hercus's publications in this journal were often long and varied, never addressing only one experiment. He often gathered up relevant miscellaneous studies and published them in a single paper. It may be that many of his findings were undiscovered by others through this practice and this may explain why other researchers in the same field did not always reference his work.

Problems with measuring iodine levels

In this ground-breaking example of applied science involving so many different disciplines, there were problems due to inadequate techniques. The researchers struggled to measure iodine in their samples. Analytical methods for trace elements were in their infancy. Fellenberg and McClendon had yet to publish their methods, which later became the accepted standards.[39] Undaunted, when Hercus, Benson and Carter published their work, they admitted that their method was not as reliable as newer methods, concluding, 'the figures [are] approximately *proportional* to the amount of soluble iodine.'[40] Hercus by this time had employed research assistant,

[37] Hercus, *A comparative study on the diet and teeth of the Maori*, 15.

[38] Hercus, Benson and Carter, "Endemic goitre," 397-8.

[39] Hercus kept a copy of Fellenberg's papers (in German) in his files. It does not appear to have been translated into English.

[40] Ibid. 331.

chemist K.C. Roberts who repeated some of the experiments using Fellenberg's methods and showed that it was reasonable to come to this conclusion. Hercus once again had persuaded the Health Department to provide 'a liberal grant' to employ Roberts for 20 months.[41]

Hercus's project was to have the effect of spurring research into the nature of New Zealand soils in addition to investigating endemic goitre. Benson and Carter had no soil analyses and few soil maps to use in the early 1920s, so looked at the geological origin of soils from Stewart Island in the far south to the top of the North Island, one site in the Chatham Islands and one in Rarotonga. H.T. Ferrar of the Geological Survey also assisted, especially with areas around Auckland, and the Chief Chemist for the Department of Agriculture, B.C. Aston provided soil samples and advice. Soil science was in its infancy in New Zealand and suitable classification needed to be determined, let alone analysis for trace elements such as iodine.[42] They tested over 500 samples for iodine and classified the rock types that the soils derived from into six main classes subdivided by soil texture type. The soils were not uniform within any specified area and the iodine levels variable. Well aware of the limitations of their study, the researchers came to some general conclusions but believed that their figures

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[41] C.E. Hercus and K.C. Roberts, "The iodine content of foods, manures and animal products in relation to the prophylaxis of endemic goitre in New Zealand. Studies from the University of Otago, New Zealand," '*Journal of Hygiene* 26 (1927): 50.

[42] Joe Kubota and W.H. Alloway, "Geographic distribution of the trace element problem," in *Micronutrients in Agriculture,* ed. Richard C. Dinauer, Vonda S. Clark and Patricia Eith. (Wisconsin: Soil Science Society of America, 1972), 533-35. This paper gives an overview of goitre studies including those of the Otago researchers and the uncertainties that still existed in understanding the relationship between soil iodine and goitre incidence, long after Hercus's work.

were too low and too variable. Swampy deposits contained higher levels of iodine adsorbed to clay colloids and the andesite volcanic soils had the highest levels. Soils in the river valleys of the South Island were very low in iodine.

Contemporary researchers were convinced that the iodine in drinking water was more important than soil iodine in causing goitre, so the Dunedin team investigated some of the water sources in New Zealand to see what contribution it made.[43] They tested a very small range of water samples – insufficient to cover the areas that they tested for soil iodine. They did not draw a link between high levels of iodine in drinking water and a lack of goitre except in areas where their results did not conform to their hypothesis. Hawkes Bay and Gisborne areas had higher levels of iodine in drinking water, which appeared to counteract the lower than usual iodine levels in the soil that they had found. They did not find any iodine in the artesian waters supplying Christchurch.

McCarrison was sure that high concentrations of calcium ions in water caused goitre, but Hercus did not agree – he had not found an increased level of goitre in limestone areas in New Zealand. Nor was there any correlation with radioactivity levels in drinking water. There were high levels of radioactivity in Christchurch water and there was a high incidence of goitre, but there were other areas with no radioactivity in drinking water and a high incidence of goitre.

Seeking the origin of iodine in the soil

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[43] Hercus, Benson and Carter, "Endemic goitre," 83. Hercus refers to United States' research dating from 1914 and 1920 that inferred water passing through particular rock types cause goitre.

The research included looking at the origin of iodine in the soil – could it have come from sea spray in coastal areas? Roberts tested samples collected by Aston from the Wellington region and established that the levels of iodine reduced in the subsoil the further the sampling site was from the sea but the surface levels stayed constant. The team attempted to calculate the influence of sea spray on fields at Lincoln but realised that their methods were not capable of measuring such small amounts of iodine deposited in this way.[44]

Working on the hypothesis that levels of iodine in the soil dictated whether an area was goitrous or not, Hercus et al. explained why their figures were not entirely conclusive. Out of 33 districts, six did not show the inverse relationship to prove the hypothesis: high levels of iodine in the drinking water explained two of these, and the others had incomplete data or complications caused by the swampy nature of the soil. In this case the iodine may have been bound to the soil and so be unavailable to plants. Hercus went further to suggest that three of the anomalous areas had had the same School Medical Officer examine the children and that 'a personal factor may be involved in the high incidence reported.'[45] Despite the availability of Hercus and Baker's classification system, the measurement of goitre was subjective and this may have been a complicating factor.

Throughout the paper, the researchers compared their work with earlier and contemporary overseas research, especially when looking for correlations with soil type, geology and topography of the land. They concluded that the situation in New

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[44] Ibid., 359.

[45] Ibid., 376.

Zealand was a mixture of those occurring in English and French river valleys and in particular, South Island river valleys were very like Swiss river valleys.

Using the example of goitre in Christchurch, Hercus dismissed some of the other putative causes of goitre. Bacterial infection of water could not have been the cause where people boiled their drinking water in the city. Farm animals also suffered from goitre even when they did not have access to water. Lambs fed purely on turnips still developed goitre (this is an observation that he was to use later on in the work on goitrogens – factors producing goitre).[46] He believed that gut infections were also not a likely cause as hygiene levels were good in the city. Perhaps in some anomalous areas this may have contributed. Fats and proteins in the diet did not cause goitre except in borderline cases he believed. New Zealanders ate a uniform diet overall and where seafood was eaten there were fewer goitres. He did not infer that extra seafood in the diet could have explained any of the anomalies in the soil survey. He concluded that iodine deficiency was the cause of endemic goitre in New Zealand because of the consumption of foods grown on iodine deficient soils.

Publicity spurs interest in preventing endemic goitre

Although the Hercus, Benson and Carter paper appeared in print in 1925, Hercus alerted his medical colleagues and the public much earlier to what he believed the situation to be – the country's soils were deficient in iodine and he was setting out to prove it.[47] He announced to the Annual Conference of the NZBMA in Auckland in March 1924: '[The] iodine content of all food must be directly related to the iodine

[46] Ibid., 384.

[47] Anon., "Goitre: incidence in Dominion," *The Press*, March 5, 1924, 7.

content of the soil and [it] was shown to be low or deficient in the great lowlands such as Canterbury and Southland.' [48]

Within days, the country's newspapers carried his talk under alarming headlines. *New Zealand Truth* gave a comprehensive factual account of Hercus's talk entitling it 'Idiocy, result of goitre – Switzerland's "cretins" – does a similar degeneration threaten parts of New Zealand?'[49] It is possible that he provided a transcript for publication. A similar article appeared in the nurses' journal *Kai Tiaki* later that year, (passed on to it by *The Auckland Star*), though with much less extravagant headlines.[50] Hercus used his address at the conference to plead for the government to introduce iodised table salt. The attendees at the conference concurred and passed a resolution to this effect. A second part of the resolution asked for funding to carry out research into the iodine content of various soils and vegetables.[51] The Minister of Health, Sir Maui Pomare, present at the conference, afterwards supported Hercus, announcing that 'The Health Department would give all assistance possible to Professor Hercus of Dunedin in his research work – labours which had received the encomiums of Dr W.J. Mayo, the eminent American surgeon, during his recent visit to New Zealand.[52] The government subsequently gave a grant of £200 to subsidise the chemical work.[53]

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[48] Ibid.

[49] Anon., "Idiocy, result of goitre," *New Zealand Truth*, March 15, 1924, 5.

[50] "Goitre in the schools – high percentage," *Kai Tiaki*, July 1924, 113-4.

[51] "Prevalence of goitre," *The Evening Post*, April 1, 1924, 8.

[52] "Goitre," *The Evening Post*, April 3, 1924, 6.

[53] Hercus and Bell, *The Three Deans*, 323.

The inter-disciplinary approach taken by Hercus to complete the study was unusual at the time and he showed great skill in bringing a big team of researchers together and co-ordinating the massive project. While others suggested research 'was needed', he took action, accessed funding and brought the project into the Medical School. He was in a unique position in that he was a professor in the Medical School but had an influential connection with the Health Department, knowing most of the Medical Officers of Health and staff of the School Medical Service and was able to draw on their assistance in gathering data on the incidence of goitre. The Press was sympathetic and frequently ran articles about his work.[54]

The paper he and his co-workers produced was extraordinary for its comprehensive nature and sheer size. It was innovative in initiating soil classification and sampling for a trace element. No one repeated this work at such a scale again. It did not produce accurate results because the methodology was unproven and the science uncertain, let alone the medical uncertainty about endemic goitre. Perhaps it had an influence on the work that led to the soil surveys in 1933 by the DSIR. It certainly inspired Hercus to investigate further the correlation between soil iodine and vegetables. This was ultimately doomed to failure, as by 1930 scientists knew that there was no correlation – the situation was much more multifaceted due to the complexities of soil structure and chemistry.[55]

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[54] Ibid., 63. The writers recognised the role of the Press during Ferguson's deanship: 'An enlightened and generally sympathetic Press, too, made its contribution to the march of progress.'

[55] B.W. Simpson, "Various aspects of iodine deficiency and the Wanaka investigation," *New Zealand Journal of Agriculture* 60 (1930): 227-8.

The most important outcome of the paper was Hercus's recommendation to provide iodised table salt to the public as a prophylactic measure and the NZBMA supported him. Hercus recommended one part iodine: 200,000 parts of salt (as used successfully in Switzerland) but the government used the weaker level of one part iodine: 250,000 parts of salt when it brought in the regulation in 1924. Manufacturers of bread and butter did not have to use iodised salt though government passed regulations permitting its use in 1927 and 1931 respectively.[56]

Endemic goitre in other countries

Interest in the incidence of endemic goitre was not restricted to New Zealand and the Great Lakes in America in the 1920s. In Britain, Sir George Newman initiated a survey of simple goitre in schoolchildren in their last year at school, over 1924-5.[57] These 375,022 children were probably aged about 12. A later analysis of the results in 1927 showed that the 600 school medical officers were merely observing the children's necks without measurement or palpation and this led to very variable results.[58] Over so many observers, the results varied considerably confusing the picture but there were some areas of concern. Even so, a 'high' incidence of 12.5 percent for S.W. England compared very favourably with 41 percent in Christchurch. Dr Percy Stocks, statistician at the Galton Laboratory in London assessed the study and dismissed it as being of little value due to inconsistencies amongst the

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[56] Maclean, *Challenge for health*, 172.

[57] J.M.H. Campbell, "The geographic distribution of goitre in school children (England and Wales)," *Journal of Hygiene* 26 (1927): 1-18.

[58] Ibid., 15.

observers.[59] He even devised a small measuring device to increase diagnostic accuracy.

Hercus's graded system of measurement was more defined but still prone to observer variability. There were, however, only 13 School Medical Officers at the time of the study. Consequently, any observations that appeared anomalous were not too difficult to reassess. Baker-McLaglan revisited some areas of concern and her figures appeared as an 'addendum and corrigendum' with the publication of the Hercus, Benson and Carter paper.[60] Stocks reported having read Hercus, Benson and Carter's paper and advised British workers to follow their experimental methods in further soil and rock analysis.[61] In addition, he recommended iodine prophylaxis for girls in some endemic areas of England, such as Derbyshire, and parts of Wales. It remains unresolved as to whether 'Derbyshire neck' was due to food grown on soils derived from Carboniferous limestone and/or water carrying excess calcium ions from passage through the limestone.[62]

Hercus sets up further experiments

Recognising that his 1925 study suffered inaccuracies because of faulty chemical analyses, and determined to eliminate endemic goitre, Hercus instructed Roberts to

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[59] Percy Stocks, "Goitre in the English school child," *Quarterly Journal of Medicine*, os-21 (1928): 223-75.

[60] Anon., "Addendum et corrigenda," *Proceedings of the University of Otago Medical School,* 1927, unpaginated.

[61] Stocks, "Goitre," 274.

[62] Sohel Q. Saikat et al., "Goitre and environmental iodine deficiency in the United Kingdom – Derbyshire: a review," *Environmental Geochemistry and Health* 26 (2004): 395-401.

implement the latest methods for measuring the iodine content of food and soils, published by German scientist, Th. V. Fellenberg in 1923 and 1924. Roberts attempted to distinguish the soluble iodine (which was available to plants) from insoluble iodine compounds in the soil but still had no success.[63] Soils of a colloidal nature, such as loam, adsorbed both soluble and insoluble iodine and Roberts found that they could not be distinguished.[64] The study went beyond measuring iodine in soils, however, and once again, Hercus produced a large multifaceted research project with the help of many other people in different disciplines, including staff from the Home Science Department of the university. His co-ordinating and managerial skills were to the fore once again, arranging for the local experts in the different fields of his inquiry to take part. In addition, Hercus had teaching duties, fifth year projects to supervise, and by now was Sub-dean of the Faculty.

Hercus and Roberts set up experimental plots at Lincoln, the Taieri Plains and Hampden to see if adding manure would increase the amount of iodine in the soil as had been suggested by other workers, but reported only one result in detail. This was of a pasture in Hampden where manuring did produce a significant increase in soil iodine, suggesting that manured soils were better able to retain iodine.[65] They commented that the iodine in decaying matter would in part at least, return to the soil. This observation seems to contradict the statement by Kubota and Alloway in 1972 that in the early soil work (which surely must have included Hercus's), 'No mention

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[63] Hercus and Roberts, "Iodine content of food," 50.

[64] Ibid., 68.

[65] Ibid., 71.

was made of the possible role of plants in the recycling of iodine to increase the iodine levels in surface soil horizons.'[66]

Hercus and Roberts also added increasing amounts of potassium iodide to experimental plots of lettuce and turnips and believed that the action did increase iodine levels in the vegetables, but they could not guarantee that the growing conditions were exactly equal in each plot, despite their inclusion of a control plot. They also tried adding Chilean nitrate to a crop of turnips but could analyse only the immature leaves that appeared in spring after the turnips had been in the ground all winter. They felt that they could see an increase in iodine content in the manured turnips compared with controls. They argued that the effect of manures was not to provide iodine directly but to enhance the capability of the plant to take up iodine from the soil.

Firstly, Hercus and Roberts analysed a selection of common foodstuffs for iodine content to establish a baseline. Seaweed contained the highest levels – although they acknowledged seaweed was not included in the average dietary of New Zealanders in the late 1920s, but this discovery was to have implications for Hercus later. They analysed vegetables grown with or without manures, peeled or unpeeled, and bread made with or without iodised salt. Once they had a reference table of these figures, they compared the products with those collected from goitrous and non-goitrous regions, over a 12-month period. The number of samples was often very small (only one lettuce and one silverbeet plant, for instance) but the researchers still used the results to reinforce their theory that foodstuffs grown in areas deficient in iodine were the cause of goitre. The values were consistently lower, they said. Corroboration, they

[66] Kubota and Alloway, "Geographic distribution of the trace element problem," 533.

believed came in the transplanting of a silver beet plant from a non-goitrous part of Auckland to the goitrous area of Roslyn in Dunedin. The iodine levels of the vegetable were lower after transplantation.

The researchers appear to have made some pragmatic decisions about where to get their samples, relying more perhaps on people that they knew who would provide them – Hercus's brother in Auckland, Emeritus Professor Sir Louis Barnett in Hampden – than whether the area sampled was representative. At times the results were outside what they expected and were deemed 'anomalous' and not considered in the averages. This was a problem because of the small number of samples. The workload to analyse all the samples that they did collect must have been very heavy.

These plant and soil experiments were never going to be able to answer the questions that Hercus asked. They were too small, badly controlled and the chemical analyses inaccurate, judged by today's standards, but they illustrate Hercus's commitment to solving the problem of endemic goitre in New Zealand, using the methods to hand.

Measurements of the excretion of iodine aid analysis

Part of this wide-ranging paper by Hercus and Roberts includes the examination of iodine excretion in the urine of goitrous and non-goitrous subjects. Hercus was attempting to corroborate Fellenberg's evidence that it was possible to correlate iodine intake from food with iodine excretion in the urine.[67] Hercus and Roberts tested 62 subjects and showed that goitrous subjects did excrete less iodine. Using students from a local women's college, he found seasonal periodicity in the

[67] Hercus and Roberts, "Iodine content of food," 73.

functioning of the thyroid gland – increased excretion occurring in the spring. Although the paper gives no details on where Hercus surveyed the subjects, he also analysed human milk for iodine content in goitrous and non-goitrous women. The results are very incomplete, indicating the exercise was perhaps rather ambitious, but it indicates Hercus's intention to investigate all aspects of goitre. He found that in goitrous areas the infant became deficient within a few weeks after birth.

> In view of the unbroken history of deficient iodine supply in utero, in infancy, and also in childhood when the organism becomes dependent on the food products of a district poor in iodine, it is scarcely to be wondered at that in certain parts of New Zealand over 30 per cent. of children have palpable goitre when they enter school at the age of five years.[68]

Although this paper did not appear in print until March 1927, Hercus had submitted it in 1926, some months before the Australasian Medical Congress met in Dunedin in February 1927. This was a very important occasion for the School, attracting several Australian experts in preventive medicine among the 600 delegates. Hercus renewed his acquaintance with men he had met during the First World War, such as Australian scientists Dr Harvey Sutton and Sir George Syme.[69] Reports on the congress appeared in several issues of *The British Medical Journal* with Hercus's work featuring among the Science Sections.

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[68] Ibid., 75.

[69] Hercus, "The George Adlington Syme Oration," 3.

A large section of the congress was devoted to discussing many aspects of goitre – incidence, pathology, radiology, anatomy and surgery – with Hercus leading a discussion.[70] While there were some parts of Australia where goitre occurred, it was comparatively rare compared with New Zealand. There was a striking difference in the death rate from toxic goitre (1.3 per 1000) compared with New Zealand (3.4 per 1000), where endemic goitre was common.[71] Following on from the congress, in April 1927, Hercus helped set up a Goitre Clinic at the Dunedin Hospital to study all the goitre cases in the hospital and at outpatients' visits. Professors of Clinical Medicine, Pathology and Surgery, and Senior surgeons at the hospital aided him in this study.[72] This study broadened Hercus's research into the more serious kinds of goitre present in the community, such as toxic goitre and Graves's Disease, culminating in a comprehensive paper outlining the results of seven years' study, in 1934.[73]

Competition in goitre research within New Zealand

Hercus was not alone in studying endemic goitre and the relationship with soil iodine in New Zealand. Dr Robert A. Shore, Medical Officer of Health teamed up with R.L. Andrew, analyst of the Dominion Laboratory to find the incidence of goitre in schoolchildren in parts of the North Island and to correlate this with the level of

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[70] Anon., "Australasian Medical Congress (BMA) Dunedin," *NZMJ* 26 (1927): 105.

[71] Frank Fitchett, C.E. Hercus and Gordon Bell, "Goitre in Otago, with notes on pathology by E.F. D'Ath," *Australian and New Zealand Journal of Surgery* 3 (1934): 318.

[72] Ibid., 318; Batchelor, "Dunedin Goitre Clinic," 147.

[73] Fitchett, Hercus and Bell, "Goitre in Otago," 318-51.

iodine in the soil and water. They published their first results in a joint DSIR – Department of Health Bulletin in 1929, to which Hercus added a largely congratulatory preface.[74] The two groups of researchers disagreed on methodology and one another's results. Hercus explained that his study was of necessity a preliminary one and acknowledged its weakness in using very few samples from any particular area.

By 1929, Andrew was able to use Fellenberg's method with some confidence in analysing soil and water samples collected from Wellington as far west as Taranaki and north to the Coromandel. Despite the acclaim that Fellenberg's method had received, Andrew found it gave unreliable results and he was unable to extract all of the iodine in the sample. Instead of accepting that his figures were lower than expected, as Hercus had done and modified his concluding statements, Andrew increased all his numbers by a third.[75] Hercus wrote that this was not really acceptable because different environmental factors could cause perturbations of the iodine content of soils and one conversion factor for all soils was 'open to criticism'.[76] Shore and Andrew (possibly only Andrew, as he was the chemist) went so far as to 'correct' Hercus's figures to match theirs, claiming that Hercus's were also too low and represented about one third of the actual level of iodine present.

Shore and Andrew criticised Hercus et al. for taking too few samples in some areas for their 1925 study and therefore making some bad errors, especially in the Taranaki

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[74] R.A. Shore and R.L. Andrew, *Goitre in school-children*, DSIR Bulletin 18 (Wellington: DSIR, 1929).

[75] Ibid., 8.

[76] Ibid., 4.

area. Hercus agreed that his research team's sampling had been limited, but then they were covering the entire country in their study, and their work also included a stronger geological review of the soils encountered. While claiming to have taken a greater number of soil samples, Shore and Andrew did collect from some rather odd sites, such as school playgrounds, racecourses, rose gardens and vacant sections, hardly places where any food crops would have been grown. Andrew submitted some representative soil samples, which he had classified as containing high, medium or low amounts of iodine, to Hercus and his research team for confirmation of their results.[77] Andrew proceeded to imply that Hercus had not critically examined the process of analysis, 'as otherwise it is almost impossible to make reliable deductions from the results of different workers.'[78]

The soils in the areas that Shore and Andrews studied were very variable and the levels of iodine that they reported covered such an extreme range that the averages they presented appear to be almost meaningless. The few facts to emerge from their work confirmed Hercus's findings that sandy soils near the sea were low in iodine and that there was no correlation of iodine content of soils and waters. In general, Shore and Andrew confirmed that there was an inverse relationship between goitre and soil iodine levels but that there were areas that did not conform. The study had shortcomings – it did not measure iodine in food eaten in the districts under investigation and did not explain why so many of the samples showed so much

[77] Ibid., 23.

[78] Ibid., 23

variation. Perhaps the farmers were using iodine-rich compost or fertilisers or the children ate more fish or took iodine-containing medicines.[79]

Hercus increases his research team

There was still much that Hercus wanted to understand about goitre and he widened the scope of his research into horticulture in an attempt to improve the iodine content of soils and food grown on them by applying fertilisers. This time his team of researchers included chemist Harry A. Aitken and Home Science graduate Helen M.S. Thomson and G.H. Cox.[80] Once again, Hercus received funding from the Department of Health. In addition, he obtained a grant from the Sir John Roberts Endowment to assist Helen Thomson's section of the research.[81]

They set up experimental pasture plots in 1929 to compare the addition of potassium iodide or manures to soils with the iodine content of the pasture. The results were not conclusive, with 'anomalies', that Hercus thought were perhaps due

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[79] Medical Research Council, First Report, H-31 *AJHR* 1938-39, 106-7; Watson, "Goitre in Thames." Watson's study of the fish in the Thames area most likely answered the conundrum: he found that the fish contained substantial amounts of iodine. It was likely that the people of Thames derived enough iodine from eating fish, of which they reportedly ate a good deal, to alleviate any iodine deficiency of the food produced in the area. Their use of iodised salt was minimal.

[80] C.E. Hercus et al., "Further observations on the occurrence of iodine in relation to endemic goitre in New Zealand and on iodide metabolism," *Journal of Hygiene* 31 (1931): 493-522. Aitken went on to publish two papers on improvements he made to measuring iodine in the blood. He went to Britain to study and died suddenly in 1934.

[81] Ibid., 494; Hercus and Bell, *The Three Deans,* 196. The Sir John Roberts Fund was established in 1920 by a gift to the University by former Vice-Chancellor, Sir John Roberts, for medical research

to the somewhat clayey soil with low retention capability and the loss of iodine through leaching.[82] He found that adding manures did not show a close correlation of iodine in pasture and soil either, but perhaps the manures did assist in increasing the absorption. He concluded that 'the availability of the soil iodine must vary from plot to plot.'[83]

In another interdisciplinary approach, Hercus arranged for researchers at Lincoln Agricultural College to analyse for iodine content some of their long-standing experimental plots of grass and clover, which they had fertilised with different manures for up to eight years. The results seemed to show that superphosphate was the most effective fertiliser for increasing pasture iodine, possibly through rendering the soil iodine available. Hercus failed to find a seaweed fertiliser that was able to release useful mounts of iodine to the pasture.

For the first time, Hercus expanded his study to include soils he had obtained from parts of Australia and some islands of the Pacific, such as Samoa, Tonga, the Cook Islands, Campbell and Enderby Islands.[84] It is not clear who provided the samples. He noted the geological formations that the soils originated from and the iodine content of the soils. There were no cases of goitre in any of the areas sampled and all had much higher levels of iodine in their soils. He correlated the higher concentration of iodine in Samoa's volcanic soils were associated with a complete absence of goitre

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[82] Hercus, et al., "Further observations," 497.

[83] Ibid., 498.

[84] Ibid., 496.

and noted 'similar and even higher values [of iodine] have been obtained in certain volcanic regions of the North Island of New Zealand.'[85]

Hercus was not alone in enquiring into whether it was feasible to increase the iodine content of the soil to help prevent goitre. Researchers in The Rowett Research Institute in Aberdeen were also investigating the effects of adding iodine to plants in 1927. They were aware of Hercus's experiments.[86] Scientists from New Zealand's Department of Agriculture visited the Institute to study animal diseases such as bush sickness, and British researchers came here on occasion to assist. One such was Beatrice Simpson, animal nutritionist, who helped staff of the Chemistry Division of Department of Agriculture investigate an outbreak of goitre in lambs at Wanaka during October 1929 and later carried out experiments in the Department's Chemical Laboratory in Wellington.[87] Simpson appears to have a clearer understanding of soil chemistry than Hercus and his researchers at the time as she stated in her report that 'there is little or no correlation between the iodine content of a soil and the iodine content of the pasture grown on it.'[88] She explained that this was because some soils gave up their iodine readily and some did not. What was crucial was the pH of the soil – acid soils gave up their iodine more readily than alkaline soils. Hercus does not mention measuring soil pH in his work.

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[85] Ibid., 497. The figures obtained for sites in Samoa still covered a wide range from 41-720 iodine in parts per 10,000,000.

[86] J.B. Orr, F.C. Kelly and G.L. Stuart, 'The effect of iodine manuring on the iodine content of plants,' *Journal of Agricultural Science* 18 (1928): 159-61.

[87] Annual Report of the Department of Agriculture, *AJHR* 1931, H-29, 28; Simpson, B.W. and R. Strand, "Feeding of iodine to poultry," *New Zealand Journal of Agriculture* 40 (1930): 403-6.

[88] Simpson, "Wanaka investigation," 228.

Hercus seemed to stop soil testing at about 1931, though he recorded some observations about the level of iodine in rainwater, which would eventually replenish the soil.[89] He compared the iodine levels in Hokitika's rainfall with that in Ophir, a small settlement in Central Otago.[90] Ophir, besides having one of the lowest annual rainfall volumes in the country is also situated as far from the sea as possible in New Zealand. In addition the general Central Otago area experiences extremes of temperature in summer and winter.[91] As expected the iodine levels were highest on the West Coast.

Controversy over iodine measurements persist

Projects of this type could never be comprehensive enough to prove categorically that low soil iodine levels were causing goitre. The laboratory methods available were very complex, often with more than 20 steps, each of them open to error and no researchers at that time appeared to be totally successful with them. As Hercus had done in 1925, other researchers added conversion factors to try to improve the accuracy of their work. Thus, Chinese researchers Adolph and Shen-Chao Ch'En used

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[89] Hercus, et al., "Further observations," 518.

[90] Ibid.

[91] J.D. Raeside, "Some Post-Glacial climatic changes in Canterbury and their effect on soil formation," *Transactions and Proceedings of the Royal Society of New Zealand* 77 (1948-49); 163. Raeside produced a table of climatic indices that showed Ophir not only had its own weather station, but that it was second only to Alexandra in having the lowest rainfall of 16.11 inches (Alexandra recorded only 13.11 inches). The Hermitage at Mt Cook experienced 161.41 inches of rain that year.

a conversion factor of 100/85 for von Fellenberg's test.[92] Andrews also converted his experimental results by multiplying them by 2/3 because he felt that they were too low. Hercus criticised Andrew's poor experimental technique for his need to introduce a conversion factor and suggested that 'Andrew's losses were mainly due to over-heating in the presence of potassium carbonate to prevent volatilisation of the potassium iodide.'[93]

Experience with Hercus's work encouraged co-workers to investigate further and publish papers themselves, including Benson and Carter.[94] Aitken investigated ways to improve the determination of iodine in blood, publishing a paper in 1930 and another in 1931 showing that he had overcome several problems experienced by the competing researchers and devising specialised equipment for the task.[95] Aitken was chemist to what was now the Goitre and Cancer Research Department of the Medical School under Hercus. In both papers, he thanked Hercus for his interest in his work.

Still struggling to perfect an iodine extraction method, Hercus and Aitken chose a different test for their next experiment in 1933, in which they analysed the iodine content of seaweeds in the Dunedin area. Hercus was attempting to manufacture an

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[92] C.E. Hercus and H.A.A. Aitken, "Miscellaneous studies on the iodine and goitre problem in New Zealand," *Journal of Hygiene* 33 (1933): 56.

[93] Ibid., 57.

[94] W.N. Benson and C.L. Carter, "The geological distribution of iodine in the soils and natural waters of New Zealand," *American Journal of Science* 14 (1927): 39-47.

[95] Harry Arthur Ashwell Aitken, "An improved method for the determination of iodine in the blood," *Biochemical Journal* 24 (1930): 91-2; Harry Arthur Ashwell Aitken, "A further note on the determination of iodine in the blood," *Biochemical Journal* 25 (1931): 446-48

edible seaweed product for use as an iodine food supplement.[96] They modified the extraction method by very careful heating and proved that this was superior to Andrew's procedure. There was obviously some building rivalry in this matter. Andrew's co-researcher Shore was an employee of the Health Department, which also provided Hercus with grants for research. Michael Watt, Director-General of the Health Department wanted to keep medical research for his officers and did not think that the Medical School should monopolise the work.[97]

In addition to measuring the iodine content of soils and water, Hercus attempted to increase iodine levels in foods such as eggs and milk through feeding hens and cows potassium iodide. The 1927 Hercus and Roberts' paper was typical of early Hercus's publications in that it contains the results of several investigations, including one in which he successfully increased the iodine content of hens' eggs by adding potassium iodide to their drinking water.[98] While in New Zealand, acknowledging that Hercus had already carried out the experiment, Rowett Institute's Beatrice Simpson repeated the experiment with R. Strand and published the results in 1929. Other researchers followed Hercus's example and acknowledged his work but Miss Simpson was not as lucky with having her work recognised.[99] Department of Agriculture's Chief Chemist B.C. Aston complained in his annual report to government that a Hungarian scientist

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[96] Hercus and his associates successfully introduced seameal products onto the market

[97] See Chapter Six of this thesis.

[98] Hercus and Roberts, "Iodine content of food," 76.

[99] O.H.M. Wilder, R.M. Bethke and P.R. Record, "The iodine content of hens' eggs as affected by the ration," *Journal of Nutrition* 6 (1932): 407.

had claimed a new method for administering iodine to hens, which was essentially the same as Simpson's and her work had been overlooked.[100]

In a second experiment, Hercus raised the iodine level of milk by feeding a cow with potassium iodide in its drinking water. He used much lower levels than in the egg trial because of its marked effect but still improved the iodine content of the milk, a result he claimed that others predicted was not possible. He used only one cow and did not continue this research, but it stands as another example of his drive to explore as many possible lines of enquiry as he could to help prevent goitre. Other scientists in this era also used very low numbers of experimental animals in their experiments and sometimes used themselves as 'guinea pigs,' including Hercus himself in 1935.[101] Hercus quoted the examples of experiments carried out by prominent workers in goitre research, notably McClendon and Fellenberg.[102] Both men experimented on themselves in about 1924 to discover how much iodine they excreted in their urine on different diets.[103]

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[100] Annual Report of the Department of Agriculture, *AJHR* 1932-3, H-29, 29.

[101] C.E. Hercus, "Skin sensitivity to bichromate," *The Lancet* 225 (1935): 985-87. This paper concerns an experiment carried out by Hercus and Purves using each other as subjects to test the effect of intradermal inoculation with bichromate, a mordant used in the preservation of animal skins and known to cause dermatitis. Hercus and Purves concluded that the test was 'a most delicate test' for chromic acid, surpassing 'any of the chemical tests.'

[102] Hercus et al., "Further observations," 502. These were the only two experiments that he could find on the metabolism of iodine in man, in 1931.

[103] J.F. McClendon, "Inverse relation between iodin (sic) in food and drink and goiter, simple and exophthalmic,' *JAMA* 82 (1924):1668-72. McClendon concluded from his study that he gained sufficient iodine to remain goitre free as long as he consumed sufficient milk, leafy vegetables and

Human trials of iodine prophylaxis

Hercus, convinced that a lack of iodine was the cause of goitre in New Zealand, set up human trials early in his research, mostly on various 'captive' groups, not just schoolchildren. He ran prophylaxis trials on patients at Christchurch Mental Hospital (Sunnyside), residents of school and university boarding hostels, the Dunedin nurses' hostel and an orphanage. Some of Hercus's fifth-year students carried out these for their dissertations.[104] Often Hercus's trials were very small, such as one using seven women in assessing seasonality of iodine excretion or five women tested for iodine metabolism, but they were sometimes quite large and lasted up to 12 years.[105] Hercus widened his prophylaxis trials in 1926.

One of Hercus's notable successes in these trials was that at Sunnyside Hospital. An early doctor in Christchurch had noted that there was an alarming incidence of goitre among patients at Sunnyside in 1888, and the incidence had not lessened by 1895 when the Inspector General of Asylums for the Colony, Edward G. Levinge

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fruits. 'Many persons do not get a large quantity of these food classes, and hence succumb to goitre,' he wrote.

104 M. Axford and A.A. Macdonald, "An investigation into the aetiological factors and treatment of endemic goitre" (Unpublished Student diss., University of Otago, 1924); H.B. Alexander and B. Henry, "Investigation to show the value of iodised salt as a therapeutic and prophylactic measure in girls' institutions where goitre is prevalent" (Unpublished Student diss., University of Otago, 1926). Alexander and Henry studied a total of 248 females at a girls' high school, two university residential colleges and one children's orphanage.

105 Hercus and Roberts, "Iodine content of food," 72-5.

made his annual report.[106] He had the water examined by Professor Bickerton, Government Analyst and Professor at Canterbury College, who found nothing out of the ordinary and that the water contained nothing chemically to account for the incidence of goitre. Dr Levinge suspected a 'telluric' influence was to blame.

Hercus also found a high incidence of goitre in the 851 patients he examined at Sunnyside some thirty years after Dr Levinge's report. In 1926-27, Hercus noted 58 percent of the women and 52 percent of the men were suffering from goitre.[107] The Sunnyside patients were especially useful for Hercus as they were mostly from the highly goitrous Canterbury area and showed a correspondingly high incidence of goitre. Unusually however, the male patients had a similar incidence of goitre to the females. He studied the different forms the disease took in these patients, finding that: 'In this centre of high endemicity, the incidence of goitre increases to about 54 percent with 20 years' residence. Exposed to these highly goitrogenous conditions, diffuse goitres develop into nodular goitres, particularly in patients over 40 years of age.'[108] Hercus recommended supplementing their iodine intake through using iodised salt for all food preparation. The patients responded well to the treatment and no new cases of goitre developed in the institution in the following ten years.[109]

Much of what Hercus achieved in his goitre research was due to his innovative idea of setting up student research projects, which greatly extended his ability to carry out human trials and to gather epidemiological data. He showed Alexander and Henry

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[106] Report of the Inspector of Asylums, *AJHR* 1897, H-7, 5.

[107] Hercus and Aitken, 'Miscellaneous studies," 55-79.

[108] Ibid., 75-77.

[109] Hercus and Purves, "Studies on endemic goitre," 193.

how to measure and classify goitres in their study of goitre in four Dunedin institutions and arranged for Miss Thomson of the Bacteriology Department to carry out the chemical analyses.[110] This time Hercus had his students focus on measuring urinary excretion of iodine before and after the administration of iodised salt. They were attempting to validate Fellenberg's assertion that 'the urine can be taken as the total daily output without any gross error.'[111] They found that the goitrous females excreted considerably less iodine than the non-goitrous ones and that adding iodised salt to the diet increased iodine excretion. The prophylaxis did reduce the size of goitres but was not fully protective. Hercus used the students' results in his 1931 paper but did not acknowledge them, which was unusual, though their project does not appear to cover the whole period of the experiment.

Correcting the iodine level in salt

Hercus was also watching the results from the annual reports of surveys done by school medical officers. Was the current level of iodisation of salt effective? In 1923, schoolchildren with goitre received one grain of potassium iodide for 10 weeks of three school terms. By 1927-28, the treatment resulted in an approximate 50 percent decrease in the size of goitres, but 'a definite number of cases develop goitre on prophylactic treatment' reported Ada Patterson, Director of the Division of School Hygiene.[112] She did not feel that the scheme was practical to continue on its current basis due to inadequate facilities and insufficient time to give 'certain individuals.'

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[110] Alexander and Henry, "Iodised salt as prophylactic measure."

[111] Ibid.

[112] Annual Report of the Director-General of Health, *AJHR* 1928, H-31, 29.

With iodised salt now on sale she expected her officers to recommend its use to parents and for them to consult their doctor if their child had goitre. The Department collected and published statistics on goitre in children for many years after this.

Why was the incidence not dropping? Maybe people were not buying and using iodised salt. It had taken some time for the salt to be imported – a full year after the passing of the regulations there was none available.[113] Once several brands of the product arrived in New Zealand Hercus had them analysed and found that only one of three had the correct concentration of one part potassium iodine per 250,000 parts of salt.[114] In 1931, the figures had changed little with five brands of iodised salt fluctuating below the standard.[115] Poor packaging and mixing allowed the iodine to migrate from the salt and to vary in concentration on settling.

Hercus appears to have asked some of his fifth year students to survey different communities about their purchase and use of iodised salt, even if their dissertation topics were not specifically about goitre. They reported very low usage in some parts of the country, ranging from 14 percent to 90 percent in the six localities studied.[116] In addition to the trials he was running in various institutions using iodised salt for all cooking purposes, Hercus enlisted the help of the Home Science School to estimate iodine intake from a realistic diet.[117] The researchers estimated how much iodine the diet based on the food eaten at the Home Science School's residential establishment

[113] Hercus, Benson and Carter, "Endemic goitre," 394.

[114] Hercus and Roberts, "Iodine content of food," 66.

[115] Hercus et al., "Further observations," 517.

[116] Annual Report of the Director-General of Health *AJHR* 1939, H-31, 107.

[117] Hercus et al., "Further observations," 493. Helen Thomson held a Master's of Home Science degree.

would contain in goitrous or non-goitrous areas. The results were far from accurate: it was not possible to measure all the iodine left in the food after cooking, or to be sure of the origins of all foodstuffs, or to know if iodine was lost from salt in storage. Hercus and Roberts estimated that a supplement of only 14.35 μg/day of iodine would be enough to prevent goitre, despite all the qualifying assumptions that they had made in their calculations. This was good news – their figure agreed remarkably well with those previously arrived at by Chatin and Fellenberg, they believed, and that assuming the salt intake was about 6g, and the salt iodised at one part: 250,000, then the 24 μg/day that it provided should have been ample to augment the dietary sources.[118]

The effect of a diet of cabbage suggests an animal model for goitre

However much Hercus wanted these human trials to give him the answers he needed, there were so many factors to control that he would dearly love an animal model to use instead. In 1931, American scientists reported producing goitre in rabbits fed on a diet of cabbage.[119] This animal model was just what Hercus wanted: 'experimental goitre has for years been an unachieved desideratum in our research', he wrote.[120] The following year he and Aitken attempted to induce goitre in six grey rabbits using New Zealand cabbage. They were very disappointed that the rabbits produced impalpable goitres that were far smaller than those reported in the literature. Hercus was uncertain

[118] Hercus and Roberts, "Iodine content of food," 67.

[119] Hercus and Aitken, "Miscellaneous studies," 70-1. As early as 1928, Chesney, Clawson and Webster reported producing goitre in rabbits, encouraging other researchers to expand this work, comparing the effects of summer vs. winter cabbages or extracting compounds from cabbages to feed the rabbits.

[120] Ibid., 71.

whether there was a substance in the cabbage that was causing the effect or if it was due to the lack of iodine in the cabbage due to low soil iodine.

Under the heading ‘Miscellaneous’ in Hercus and Aitken’s 1933 paper they included what would turn out to be a circuit-breaker in the search for a way to measure dietary iodine intake – the measurement of iodine excreted in urine – probably suggested by Herbert Dudley Purves, a chemistry graduate, who had joined the School’s staff in 1932. Purves had made a critical appraisal of the goitre programme on his arrival at the School.[121] There was a precedent for this: a Swedish study presented at the International Conference on Goitre at Berne in 1927 had correlated a high iodine excretion with a low goitre index, but there was so much uncertainty about the causes of goitre that it was not well publicised.[122] Hercus and Aitken measured the iodine levels in urine from patients at Sunnyside and compared them with urine samples from Samoans, who did not suffer from goitre. Until this date, Hercus had compared goitre statistics only within New Zealand. The results showed a huge difference – 26μg of iodine excreted over 24 hours for the Christchurch patients compared with 302μg for the Samoan samples. Hercus believed that the difference was due to the high iodine content of the Samoan diet but did not indicate at this stage that he might adopt the method of measurement more generally

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[121] H.D. Purves, “Twenty years before the Act and after,” in *Research Review 1976*, 42. MRC 1950-90, YCBN 59997 Box 16g (R773124), Archives New Zealand.

[122] Hercus and Aitken, “Miscellaneous studies,” 74. Endemic goitre had long been recognised in Switzerland and in August 1927, the country hosted the Berne International Conference on Goitre. Reports in the *BMJ* noted 120 experts from 16 different countries attended, but McCarrison’s work received the most publicity.

in his research. The chance to use it came almost immediately when confronted by a critical publication by Shore and Andrew.

In 1934, Shore and Andrew published another DSIR Bulletin in which they explained that they had reinvestigated the anomalous areas from their last paper and had an unexpected finding to announce, that they no longer supported Hercus's theory correlating low soil iodine's with a high goitre incidence.[123] Unsurprisingly, there was no preface from Hercus to this work. Purves later wrote that 'For Sir Charles, the iodine deficiency theory was a matter of faith and those persons, and there were many of them, who doubted or denied it were regarded as infidels and thoroughly damned.'[124] This single-mindedness could have proved a great embarrassment to Hercus had he been proven wrong. Fortunately, Purves was able to show that Shore and Andrew's results were too variable to draw meaningful conclusions.[125] Even pooled milk samples varied widely. New Plymouth with soil iodine levels of 930 parts/10 million produced the same goitre incidence as Thames with 74 parts/10 million. This suggested to them that the iodine in the soil in New Plymouth could not have been in an accessible form.

To prove that the high iodine content of the soil in New Plymouth bore no relationship to the incidence of goitre, Hercus and Purves measured 24-hr urine samples from schoolchildren in New Plymouth, Cromwell and Samoa. The iodine excreted by the Samoan children (146 μg/24 hr) was nearly three times greater than

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[123] R.A. Shore and R.L.Andrew, *Goitre in school-children, DSIR* Bulletin no.45. (Wellington: DSIR 1934), 39.

[124] Purves, "Twenty years before the Act", 43.

[125] Hercus and Purves, "Studies on endemic goitre," 182-202.

that by New Plymouth children, and the soil iodine in New Plymouth greatly exceeded that in Samoa.[126]

Purves reworked the analytical method for determining iodine in samples but welcomed a new report from the British MRC outlining a new method, which he hoped all workers in the area would use so that there could be comparability. He and Hercus eventually abandoned the analysis of foodstuffs because the methods were difficult and time-consuming and assessing a diet accurately was nearly impossible. They chose to base their conclusions on 'the more accurate determinations of urinary excretion, which may be assumed to constitute some constant fraction of intake.'[127] From a study of the literature they determined a range of iodine excretion figures relevant to goitrous (17-87 μg iodine/24 hr) and nongoitrous regions (112-186 μg iodine/24 hr). They concluded that 'an iodine intake less than 160 μg iodine per day is a prerequisite for goitre production.'[128]

Hercus and Purves revisited the problem of the goitre prophylaxis programme running in New Zealand. Hercus was still not happy with its equivocal success. A proxy measure of the use of iodised salt, the rate of importation of iodised salt, was still too low. New regulations brought in to ensure a maximum-minimum standard in 1932 did little to help and in 1935, the BMA wanted all salt to be iodised but this did not happen. Hercus, determined to solve this problem extended his long-running trial at the Nurses' hostel in Dunedin by increasing the iodine content of the salt until the nurses' iodine excretion rates matched those found in Samoans. Initially, the trial had

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[126] Ibid., 188.

[127] Ibid, 184.

[128] Ibid.

been less satisfactory with two nurses out of 70 staff developing goitre over 10 years of using commercial iodised salt for all purposes.[129] He now increased the strength of the supplement to 1:20,000. This increased the level of iodine excreted in the urine to one approximating that found in non-goitrous areas.[130] He was also running similar trials in a local orphanage and a boarding school and the results were similar, he wrote in his report. He and Purves calculated that New Zealanders needed to supplement their iodine intake by 100 μg/day. This was in addition to the iodine that they were getting from commercial iodised salt. It took until 1939 for the necessary regulations to be passed to increase the level of iodine in salt and it was not until after 40 that the incidence of goitre in schoolchildren fell substantially.[131]

Conclusion

Hercus's early work on goitre is an example of applied research on a comparatively large scale for any country at the time. It was unusual for endemic goitre to occur throughout an entire country and therefore requiring investigations into water supplies, soils and their parent rock in all areas. In countries such as the United States and Britain, endemic goitre was not major problem and was localised. Also in Switzerland where the problem was serious, it was already known to be localised to particular areas. New Zealand offered a clean slate for Hercus to study: soil science was in its infancy and geologists had yet to complete their surveys. Even the aetiology of the disease was incompletely understood. Hercus systematically eliminated

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[129] Hercus and Purves "Studies on endemic goitre," 193.

[130] Report of the Director-General of Health, *AJHR* 1939, H-31, 108.

[131] Maclean, *Challenge for health,* 173-4.

possible causes of the disorder in one of his first papers with Baker before deciding the cause was likely to be lack of iodine in the diet.[132]

He was fortunate in that his study area – New Zealand – was limited in size and population, making the collection of data from the whole country feasible. Losee writing on the value of geographical isolation in carrying out epidemiological research designated New Zealand as an ideal model, and Hercus, Benson and Carter's work as an 'outstanding early example of an ecologic human health study.'[133]

Hercus's co-operative 1925 study was acclaimed for its thoroughness in planning and execution, praise for which should go largely to him. New Zealand did not have a recognised scientific research institute in 1925 though the DSIR was established the following year. A push from the NZBMA to establish a Medical Institute in Dunedin at this time, failed, making Hercus's research programmes effectively the only ones in the country. There does not appear to be any serious competition for health research funding at the time (apart from some pleas from Watt to let his medical officers pursue research) and Hercus's persuasiveness kept funds coming from the government for many years. He co-operated with the Department of Health in pursuing goitre as a public health issue, a vital relationship forged initially through his employment by the Department in 1920.

His skills in administration ensured that the experimental investigations of endemic goitre resulted in the publication of scientific papers and enhanced the School's reputation. The work eventually resulted in the virtual elimination of endemic goitre

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[132] Hercus and Baker, "Further consideration, I", 79-89.

[133] F. L Losee, "Geographic isolation: its value in epidemiological research," *Journal of Dental Research* 42 (1963): 202-3.

in New Zealand 'saving countless thyroid operations and the birth of cretinous children.'[134] During his experiments, he and his team of researchers developed an animal model for goitre when an American model failed under New Zealand conditions and later expanded the research into studies on other thyroid conditions.

Developing the goitre project allowed Hercus to seek and employ new staff especially after becoming Dean. For 13 years in addition to his teaching duties and research efforts, Hercus had been Sub-dean at the School and during this period, he was building the research capability with research into several infectious diseases and allergies produced through human interaction with the environment. In these projects, his senior students helped Hercus as they had with his goitre studies. The following chapter introduces some of these areas of research.

[134] Duncan Adams, "The legacy of Sir Charles Hercus," 97.

Chapter Five: Hercus and the development of preventive medicine in New Zealand

*Medical research involves the proper development and the right use of the human body in all conditions of activity and environment as well as with its protection from disease and accident and its repair***.**—C.E. Hercus, 1950[1]

It is no use starving scientific research work.—G.M. Thomson, 1926[2]

Introduction

In addition to working to solve endemic goitre in the 1920s, Hercus focused research on infectious diseases affecting the country's youth. 'Inevitably, the war had heightened the emphasis on the sancitity of life, premature deaths of the country's youth and universal grief renewed the value of birth and turned more attention to the child and the mother', wrote Mein Smith about the 1920s.[3] Truby King lamented 'the quite unjustifiably large proportion of malnourished, flat-chested, retarded, weakly, undersized, underweight children attending our schools.'[4] There were epidemics of influenza, measles and whooping cough in 1920-21, as well as high incidences of scarlet fever, diphtheria, enteric fever (typhoid), tuberculosis, cerebrospinal meningitis and poliomyelitis and an outbreak

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[1] Hercus, "Second Hudson Lecture," 105.

[2] "Scientific and Industrial Research," *NZPD*, August 6, 1926: 223.

[3] Philippa Mein Smith, *A concise history of New Zealand* (Cambridge: Cambridge University Press, 2005), 135.

[4] Annual report of the Director-General of Health, *AJHR*, H-31, 1922, 31.

of smallpox in Otago.[5] Hercus's research in the 1920s included investigations into common infectious diseases such as poliomyelitis and diphtheria as well as an inquiry into the surprisingly common affliction of hay fever, and an attempt to elucidate the causes of rheumatoid arthritis.

The study into hay fever arose as a consequence of the introduction of English grasses (with their pollens' enhanced ability to cause allergies) to help maintain the 'imperial food chain' supplying Britain with frozen meat and dairy products from stock reared on these pastures.[6] Hercus also aided Sir Louis Barnett's campaign against hydatid disease. In all of these projects his students assisted, greatly increasing the amount of research that the School could carry out under financial constraints due to the fluctuating economy of the period. The investigations brought him and his students increasingly into contact with the public enhancing the School's reputation in research and caring for the public health.

With a growing interest in scientific research after the First World War, pressure grew to establish not only a Department of Industrial Research, but also a Medical Research Institute. The New Zealand economy of the 1920s could not support both and the amount of money available for medical research at the School was also limited. This chapter will follow Hercus's involvement with these events and the research projects that he either initiated or guided before becoming Dean in 1937.

A DSIR for New Zealand; not a Medical Research Institute

[5] Annual report of the Director-General of Health, *AJHR*, H-31

[6] Mein Smith, *History of New Zealand*, 123.

In both Australia and New Zealand, discussions about improving scientific research came to prominence in early 1926 when Sir Frank Heath, Secretary to the British DSIR, came 'to inquire into and report on Imperial co-operation in scientific and industrial research work,' in each country.[7] His visit coincided with the NZBMA's annual conference in Nelson in February. Hercus, by this time Sub-dean of the Medical Faculty, was unable to attend the conference and appealed to the NZBMA to support his appeal to establish a medical research institute in Dunedin.[8] The Dean, Sir Lindo Ferguson also supported the bid, writing to the Director General of Health (Valintine) prior to the conference in February, requesting that the institute go ahead and to put the current research onto a more definite footing.[9] By now Hercus and his colleagues had begun several research projects within the School that included investigating rheumatoid arthritis, polio (using monkeys as experimental animals), hay fever, tuberculosis, as well as goitre.

The grant for polio research was mostly spent on housing the monkeys and if the grant were not renewed the project would be worthless, the Dean wrote. Valintine replied that it was high time that the research work was put on a definite footing and wanted the Dean to refer the matter to the Board of Health, which he did. There is no record in the files on the outcome of this request.

In his inaugural speech to the conference Dr Gibbs, president of the NZBMA was quite clear that 'the study of preventive medicine was practically neglected in New

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[7] George Currie and John Graham, *The Origins of CSIRO: Science and the Commonwealth Government 1901-1926* (Melbourne: CSIRO, 1966), 147.

[8] Hercus's first son was born about this time.

[9] Lindo Ferguson to Dr T.H.A. Valintine, January 22, 1926. ARC-0193, 94-121/19 (1926).

Zealand' and that 'the preventive aspect of medicine should be a pervading influence all through the curriculum.'[10] He noted in addition, '[t]he decreasing birth rate throughout the white race, and particularly as regards the British race … lessens the number the race can afford to sacrifice to preventable diseases.'[11] Gibbs was particularly disturbed by the possibility that

> germ life will overwhelm the human race owing to the fact that germ reproduction and existence is so simple and that germs can change the elements of earth and air directly into food, while man is an indirect feeder and needs the elements converted into meat and grain before he can use them.[12]

While acknowledging that this might not be true, it further supported Gibb's request for investigation and research, such as could be carried out at a Preventive Medical Institute set up in Dunedin near the School. He listed a series of topics requiring attention such as the health effects of eating poor quality bread, whether the fashionable use of paraffin oil as an aperient was causing an increase in intestinal carcinoma or even if fine glass particles from enamelware or steel from roller mills accidentally incorporated in food could be causing appendicitis.[13]

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[10] S.A. Gibbs, "Medical research," *NZMJ* 25 (1926): 44-5.

[11] Ibid., 42-9.

[12] Ibid. 45.

[13] Ibid. 47.

Hercus later conferred with Gibbs about the NZBMA's bid to centre research in Dunedin.[14] A deputation of the Executive Council of the NZBMA presented a detailed statement to the Prime Minister listing 18 specific projects in preventive medicine that needed investigation.[15] Unsurprisingly perhaps, these included Hercus and his colleagues' research into goitre, hydatid disease, nutrition, tuberculosis, poliomyelitis and hay fever. In the week following publication of this report in *The Evening Post*, a second one appeared that laid out a financial plan for the institute and the roles of its proposed employees. It also claimed that the establishment could aim to emulate the Lister or Pasteur Institutes, albeit on a much smaller scale.[16] The presentation shows that Hercus and others investigated the project thoroughly, even proposing building the institute on land at Seacliff where researchers could do their fieldwork. The report emphasised the need for an independent director with no teaching commitments and for funding from the Consolidated Fund separate from the University of Otago.

The proposed 'Institute of Preventive Medicine' at Dunedin did not eventuate. The bid did not have the backing of the Deputy-Director of Health, Michael Watt, who wanted such a medical institute to be in Wellington and the work to be for his medical officers, not those at the Otago Medical School.[17] Mostly due to Hercus's efforts, the

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[14] Anon., "Minutes of the Council," *NZMJ* 25 (1926): 229.

[15] "Causes of Diseases," *The Evening Post,* June 26, 1926, 12.

[16] "Medical Research," *The Evening Post,* June 30, 1926, 10.

[17] "Public health," *The Evening Post*, August 13, 1940, 8; Anon. "Editorial: Public health problems of New Zealand," *NZMJ* 40 (1941):81-83. Both of these later commentaries are on Watt's views about siting a medical research institute, which he believed should not be attached to the Medical School in Dunedin as this would 'not be in the best interests of the community.'

School had already captured all the money allocated for research in 1925 (£1982) and in 1926 was to get £5000. In the Parliamentary Supply Debate over funding medical research, Members of Parliament expressed their displeasure at having to pay the expenses of Dr MacEachern, an American hospitals' specialist invited by the NZBMA to attend the February conference following his visit to Australia.[18] This cannot have helped the Association's pleas for the establishment of a medical research institute.

Heath's report

In May 1926, Heath presented his report to the New Zealand government, which then established the DSIR in August, bringing together several research projects, mostly aimed at improving the production of crops and pastures, animal health and 'all phases of industry.'[19]

The areas of scientific research covered by the DSIR and the Australian CSIRO (also established in 1926) included improving the production of livestock and farm produce for export, which was essential for both countries, and overcoming environmental challenges to human health. At times some areas of research at the DSIR overlapped with medical investigations at the Medical School, such as bovine tuberculosis and hydatid disease. Hercus worked at times with sections of the DSIR such as with the Geological Survey during his goitre work and with the Dominion Laboratory indirectly through the Department of Health in measuring iodine levels in 1928.

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[18] "Supply," *NZPD*, July 30, 1926: 1212-13.

[19] Annual Report of the Department of Scientific and Industrial Research *AJHR* 1928, H-34, 1.

Professor John Malcolm joined the Council of the DSIR during 1927. He carried out and supervised some nutrition research during 1927 but it is not clear if the work was at the Medical School or elsewhere in the university.[20] Hercus and his colleagues also co-operated with the Cawthron Institute, an independent organisation, whose assistant director Theodore Rigg, was a member of the DSIR Council. Rigg represented the DSIR at overseas conferences in 1927-8 and was later to accompany Hercus to the Empire Conference in Britain in 1946.

The New Zealand scientific community did not wholly endorse the changes wrought by the establishment of the DSIR. During the debates published in daily newspapers there were arguments about whether or not universities should carry out research. One commentator, 'a man whose name is known throughout Australia in connexion with research work' wrote:

> Actual experience of work done by universities indicates that in New Zealand, as in other lands, the university is not the place at which to undertake research. The primary duty of the university is teaching, and as in New Zealand the universities are understaffed, how can they carry out research work in addition to giving instruction?[21]

Hercus was very much in favour of university research and that the advancement of knowledge was a primary function of a university: 'I feel certain that unless the

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[20] Ibid., 9. Malcolm also co-operated with the Lister Institute in investigating the vitamin content of butter.

[21] "Heath Report," *The Press*, June 2, 1926, 8.

professor undertakes some research of his own, at the same time encouraging and stimulating his staff continually to do otherwise, there will be no vitality in his department.'[22]

Hercus's research into infectious diseases

Despite the failure of the initiative to establish an Institute of Preventive Medicine, Hercus contributed to New Zealand preventive medicine in this early period through the study of infectious diseases – their epidemiology and prevention by vaccine if possible. He also encouraged research into rheumatoid arthritis, a condition of unknown cause. Authorities believed that rheumatoid arthritis in New Zealand in the mid-1920s was more prevalent and caused more disability and suffering than cancer. It attacked middle-aged and young people, crippling them for life, so when there seemed to be a chance to prevent rheumatoid arthritis, Hercus was encouraged to try to develop a vaccine.[23]

In 1925, researchers suspected that bacteria caused rheumatoid arthritis, a term covering a 'group of chronic joint affections of uncertain nature.'[24] Some American researchers claimed to have recovered bacteria from patients and Hercus attempted to

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[22] Hercus, "Second Hudson Lecture," 106.

[23] "Rheumatic Diseases," *The Evening Post*, September 22, 1925, 6.

[24] Humphry Rolleston, "Rheumatoid arthritis: its causation and treatment", *Canadian Medical Journal* 15 (1925): 889. The uncertainty also led to experimental light treatment, faith healing, quack devices (such as the Abrams treatment), and to nutritionists blaming the disease on a lack of wholemeal in bread. Advertisements and articles on all of these occurred in *The Evening Post* between 1921 and 1927.

replicate this work.[25] It did not appear that all cases had a septic focus, however. British authority Humphry Rolleston was beginning to suspect that 'something, perhaps an attack of influenza has broken down the individual's immunity and powers of resistance. … The disposing factor may be inherent and congenital, such as the conformation of the body.'[26] Despite this hint that something other than an infection could cause rheumatoid arthritis, researchers continued searching for bacteria in patients and attempted to eliminate them by various means – there were no antibiotics in 1925. To this end, they used compounds that would disinfect the body, such as acids, iodine, sulphur and manganese, or thyroid extract to increase the metabolism, as well as removing septic tonsils and teeth.[27]

Orthopaedic surgeon, James Renfrew White obtained a £600 grant for two years from the government for the study. Hercus joined a committee comprising White and Dr Marion Taylor to advise research fellow K.R. Steenson on how to carry out the bacteriological work.[28] Steenson was to replicate the American work that claimed to show that there were streptococci or staphylococci in the blood and/or in the joints of patients with the illness, then known as 'chronic infectious arthritis.' If this were true, then there was some hope of cure through using autogenous vaccines made from the patient's infective material gathered from such sources as septic teeth or tonsils.

The procedure would involve identifying the causative bacteria in patients' samples and then making vaccines from cultures of the bacteria to inject back into

[25] Charles E. Buckley, "The causes and treatments of arthritis," *BMJ* 1 (1934): 470.

[26] Ibid., 892.

[27] Ibid., 894.

[28] Carmalt Jones, *Annals*, 209.

patients.[29] The methodology chosen included carrying out a 'complement fixation test' that formed part of Hercus's bacteriology course. The complex process involved using three different laboratory animals – sheep, guinea-pigs and rabbits, to find the infecting bacteria. Steenson, in conjunction with Eric D'Ath and J.U. Williams had already published a paper in the *New Zealand Medical Journal* describing how they had used the test to evaluate the procedure in diagnosing gonorrhoea, carrying out the work at the Venereal Clinic of Dunedin Hospital under Dr A. Marshall.[30] This may have been the men's fifth-year dissertation, but it has not survived in the collection at the Medical School Library. Hercus took responsibility for submitting the paper for publication and promised to repeat the procedure 'from time to time', to promote the students' discoveries.[31]

Ultimately, Steenson had no success in the rheumatoid arthritis study. It was possible that any bacteria that he did find were actually contaminants, as suggested by other workers who could not replicate the American work either. Although Hercus does not mention using it as a tool in this study, other researchers claimed success with 'protein shock therapy' in rheumatoid arthritis, whereby doctors injected the patient with a 'non-specific' protein, such as milk, bee-stings, or TAB vaccine (Typhoid-paratyphoid A and B vaccine).[32] Proponents claimed that the procedure

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[29] Buckley, "Arthritis," 471. The procedure was not without risk and considered illogical a few years later.

[30] E.F. D'Ath, K.R. Steenson and J.U. Williams, "Complement fixation test in gonorrhoea: the technique of its performance and its value in diagnosis and prognosis of gonococcal infections," *NZMJ* 23 (1924): 29-41.

[31] Hercus, preface to "Studies from the Department of Preventive Medicine," 27.

[32] Rolleston, "Rheumatoid arthritis," 896.

acted ‘as a general “push-up” [to] the sick body and impel it to fight disease.’[33] It is unlikely that Hercus advised Steenson to try this treatment as he is said to have been vehemently opposed to it to the extent that it became one of his ‘pet bogies’, according to colleague Batchelor.[34]

Several of the early research projects failed in their objectives, perhaps because laboratory techniques were inadequate to identify the causative microorganisms, but also because no one had yet formulated the concept of autoimmunity as a cause of disease.[35] A premature announcement about the rheumatoid arthritis project caused Hercus some anguish in 1926. He had to acknowledge the work’s failure to a correspondent in Nelson following a news release by Sir James Parr, High Commissioner in London.[36] Parr had been describing the creation of the DSIR and ‘incidentally paid tribute to the work of New Zealanders; Dr Hercus in connection with goitre and rheumatic arthritis, and Dr Tilyard in dealing with fruit pests.’[37] The correspondent’s wife suffered from the disease and he wanted to know what valuable

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[33] “Sunshine Tablets,” *The Evening Post*, December 8, 1927, 23.

[34] J.D. Hunter, “The Clinical Club of Dunedin (1915-1939),” in *Proceedings of the First New Zealand Conference on the History of New Zealand and Australian Medicine*, ed. R.E. Wright-St Clair (Waikato: Waikato Medical Post graduate Medical Society, 1987): 182.

[35] Duncan Dartrey Adams and Christopher Dartrey Adams, *Autoimmune disease: pathogenesis, genetics, immunotherapy, prophylaxis and principles for organ transplantation*, Springer Briefs in Public Health (London, Springer Dortrecht Heidelberg, 2013), 43. Rheumatoid arthritis, an autoimmune disease is now believed to be triggered by infection with the bacterium *Proteus mirabilis.*

[36] Sub-Dean [Hercus] to James Hunter, November 3, 1926, ARC-0913 94/121 19 (1926).

[37] “Work of committees,” *The Evening Post*, October 30, 1926, 9.

discovery Hercus had made. Hercus denied that there had been any progress and apologised:

> Unfortunately, our work so far has been largely of a negative nature and I can suggest no other treatment than the routine medical treatment which your wife has been undergoing. I am extremely sorry that the High Commissioner should have allowed his imagination to run ahead of the facts with regard to this matter. It was a matter of very great regret to me that Sir James Parr, by his reference to this work, should have created the impression that we had made some material advance in our knowledge of this disease.[38]

Steenson resigned in 1927 to take up a Rockefeller Research Fellowship in the Solomon Islands.[39] The project does not seem to have lasted after this, Steenson having exhausted all the experimental avenues open to him in this period. It remains an early example of Hercus's practical encouragement of bacteriological research at the School.[40]

Investigation into poliomyelitis

A better-understood illness was poliomyelitis – at least bacteriologists knew that the cause was an infectious agent – but it too presented technical difficulties for

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[38] Sub-Dean [Hercus] to James Hunter, November 3, 1926, ARC-0913 94/121 19 (1926).

[39] Steenson maintained contact with Hercus and in 1939 provided goitre statistics from the Solomon Islands for him.

[40] The term 'bacteriology' included the study of viruses for many years.

researchers in the mid-1920s. The only known method of culturing the suspected virus to make a vaccine, the ultimate aim of the work, was by using monkeys. As mentioned earlier, Hercus secured funding to accommodate monkeys in the Medical School for this project, which he adopted by default when a team of researchers in Wellington could make no headway with their study and appealed to him for assistance.

Outbreaks of poliomyelitis occurred periodically in New Zealand in the 1920s, with an especially large one over 1924-5 which spurred a concerted research effort at Wellington Hospital by former student and colleague of Hercus's, pathologist Philip Lynch, Dr Wilson and Trevor de Clive-Lowe, a final-year medical student. Lynch had worked with Hercus in the Departments of Pathology and Bacteriology at the Medical School between 1923 and 1925 while studying for an MD on virulent staphylococcal infections. He and Hercus were great allies whose paths crossed numerous times in preventive medicine. Lynch stayed with the Hercus family on his later visits to Dunedin.

By the time that Hercus returned to Dunedin from his trip into the Urewera Country over the summer break of 1924-5, Lynch had been called to Wellington Hospital where he, Wilson and de Clive-Lowe, studied pathology samples from poliomyelitis victims in the hope of culturing the micro-organism that was causing the disease. At this stage, it was not certain that a virus was involved. They also evaluated the lesions caused by the infection to see if they were any different from reported cases in the medical literature and found that they were not. Nevertheless, their most ambitious task was to derive a vaccine from the infective material using the only experimental animal known to be capable of catching poliomyelitis, the monkey.

The men sought advice from Hercus as they struggled to grow the virus in culture. They had to admit defeat after making over 100 cultures without producing a pure culture, without which they could not make a vaccine. At this time there was an early type of vaccine in use made from the serum of patients recovering from poliomyelitis and Wellington Hospital's Dr W. Robertson was using this 'convalescent serum' to treat a number of polio victims with some success, but there was never enough to treat all the victims.

Lynch and his team duly sourced five Macaque monkeys from the 'municipal authorities' in Wellington and Auckland. Their attempts to infect the monkeys were largely ineffectual, but eventually they infected two animals in some rather gruesome experiments inoculating the material directly into the brain. In this way they produced some infective material for further study but after three months of concentrated effort, gave up the task and Lynch took the all the samples to Hercus at the Medical School.

By now Hercus had obtained £2000 from the government to support a year's research by him and his research assistant Dr Charles Monro Hector, lately pathologist at Wellington Hospital. The NZBMA backed the appeal for funding. Over the next two years, Hercus and Hector imported 46 monkeys from Calcutta (two died en route, two on arrival, and 25 survived until 1927). At times when shipments of monkeys arrived, newspapers alerted the public with misleading comments about the experiments, causing much controversy. *The Auckland Star* commented in 1927:

> The eleven monkeys are not for the zoo. Theirs is to be a worse fate. They are to be used by students at the Otago University in connection with infantile

> paralysis research work. A similar number arrived for the same purpose last year, and apparently gave complete satisfaction (to the students).[41]

A flurry of letters to the editor caused *The Otago Daily Times* to print a denial a few days later explaining that the object of the research was not to amuse the students but to protect if possible the children of New Zealand from infantile paralysis.[42] 'The disease is produced in the monkeys by inoculation in a mild form, and no more pain is caused than one would readily submit oneself to in the interests of science.'[43] The controversy occurred again with a shipment in September after *The Auckland Star* printed an image of two caged monkeys destined for the School.[44]

Hector published the results of his largely unsuccessful attempts to infect 17 monkeys in 1927.[45] The virus was present he believed but 'its virulence was of a low order, not sufficient to give the rapid propagation of the disease required for the purpose of immunity tests.' The outcome of these experiments 'apparently was to immunize the monkeys by mild attacks.'[46] He also failed to infect rabbits with the virus.

The project illustrates the difficulty Hercus and co-workers faced of working with viruses in these early days when the only techniques available involved using live

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[41] "Oil and monkeys, partridges, rice, and pig iron: assorted cargo from India," *The Auckland Star*, May 16, 1927, 9.

[42] "Monkeys for Otago University," *The Evening Post*, May 23, 1927, 8.

[43] Ibid.

[44] "In the cause of science," *The Auckland Star*, September 14, 1927, 10.

[45] C.M. Hector, "Poliomyelitis," *Supplement to The Medical Journal of Australia* 2 (1927): 258-61.

[46] Ibid.

‘exotic’ animals. The monkeys proved difficult to feed, house and generally care for, despite the provision of a new monkey house on the roof of the Medical School, paid for by government funding of another £2000 secured by Hercus. Again, the research suffered through lack of suitable techniques and knowledge at this early date. Another factor in the demise of the project was the onset of the depression that severely limited funding for medical research.[47]

Hercus and Hector were not able to get fresh infective material after 1925 and the project ended. They were able to gain some insight into the course of the disease and its epidemiology, however, and the School benefited from the project in that the monkey house could be used to house other experimental animals such as cats and rats.

Hercus discussed the epidemiology of poliomyelitis in the *George Adlington Syme Oration*, which he gave to the Royal Australasian College of Surgeons in July 1937.[48] He called for research into ‘some of the unsolved problems of poliomyelitis, with particular reference to the immunological status of selected sections of the community.’ He was not advocating repeating the earlier experimental work with monkeys but emphasised the need for preventive measures. He also saw that ‘without a doubt, active immunization will be possible, when all children might be immunized during the first year of life.’[49]

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[47] “Medical research,” *The Evening Post*, April 19, 1937, 10.

[48] Hercus, “George Adlington Syme Oration,” 3-19. Hercus had met Syme in Cairo during WWI when Syme was in charge of surgery at the Australian General Hospital at Heliopolis. Hercus felt he was very honoured to give the oration, as he was not a surgeon, but a ‘teacher of preventive medicine.’

[49] Ibid., 10.

A newspaper reporter relayed the part of Hercus's lecture referring to poliomyelitis to several newspapers the following day, creating controversy and prompting a critical letter from Dr Thomas McKibbin, Dunedin's Medical Officer of Health to the Director-General of Health.[50] McKibbin believed that Hercus had virtually branded him as a quack for putting extreme precautions in place to stem the Dunedin epidemic. In her thesis, Ross writes that 'Hercus was being deliberately two-faced. While very publicly advocating the value of acquiring natural resistance by exposing young children to the virus, Hercus had privately acquired serum and inoculated his own children.'[51] This statement appears to be based on McKibbin's saying 'to my knowledge [Hercus] inoculated his own children with the serum.' Mary Hercus-Rowe does not believe this to be credible as her brother Murray contracted poliomyelitis as a young adult. In addition, the Hercus children called their father 'Doctor of Prevent Medicine' because of his cautious use of medicines.[52] It would seem very unlikely that Hercus did take this course of action. In the 1920s when Hercus was carrying out this bacteriological research, there were few vaccines available and one of these he was familiar with was that for smallpox.

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[50] T. McKibbin to M.H. Watt, January 10, 1937. ADBZ 16163 H1 Box 1952 131/9 alt.no. 3703 (R20954758) Archives New Zealand. Poliomyelitis. Document viewed in possession of Mary Hercus-Rowe, 2013; "Plague precautions," *The Auckland Star*, February 28, 1922, 5; "Disrated: Dr McKibbin's sentence," *The Auckland Star*, March 24, 1922, 5. Mckibbin had a chequered history with the Department of Health, having begun employment in 1921 in Dunedin and moved to Auckland in early 1922. While in Auckland he openly criticised the Minister of Health over plague protection measures and was sent back to Dunedin on a reduced salary later in the year.

[51] Ross, "Mind over muscle."

[52] Interview with Mary Hercus-Rowe, September 22, 2010.

Hercus and smallpox vaccine

A project that Hercus gave practical assistance to in the mid-1920s was in making a vaccine to smallpox but his involvement with the disease began much earlier. Relatively small epidemics of smallpox occurred in New Zealand, notwithstanding the long distances travelled by immigrants to arrive in this country. It was vital that supplies of vaccine were always available. Several enterprising doctors, such as Dr Hacon, Superintendent at Sunnyside Hospital, produced lymph from calves and gave supplies free to any medical practitioner as early as 1882.[53] Dr Joseph Faulknor set up what was to become New Zealand's first official vaccine station in Hastings in the early 1880s using some of Hacon's material.[54] By 1904 the station was making 1000 tubes of vaccine a day to respond to an outbreak in Christchurch, and aimed to increase this to 2000. Supplies of vaccine increased when the Wellington Vaccine Station opened in 1905, but these were of variable efficacy for some years.[55] The Station modelled its production on the British method of scarifying the calf's lower abdomen and introducing the infective material. Once the calf produced smallpox vesicles, technicians collected the lymph and ground the material into a pulp, sieving it and mixing it with glycerine and storing. Only when bacteriological tests proved the

[53] "Christchurch: from our correspondent," *New Zealand Tablet*, February 10, 1882, 11.

[54] "Dr Mason's movements," *The Star*, June 7, 1902, 4. Chief Health Officer, Dr Mason inspected the new Government establishment for producing vaccine during this week and 'states that the establishment is as complete as any in the world, and will enable the Department to guarantee as absolutely pure every tube of vaccine sent out.'

[55] Public health statement by the Minister of Health, *AJHR* 1905, 35; Annual Report of the Public Health Department H-31, *AJHR* 1908, 49. The case-success rate was only 75 percent in 1908, reducing from 91-95 percent in earlier years.

vaccine was not contaminated and the calves healthy at post-mortem, was the vaccine released. The process involved much practical bacteriology in testing the lymph for contamination and tuberculin-testing of the calves.

In 1922, the Director of the Wellington Vaccine Station, bacteriologist John Hurley issued an invitation to senior medical students to visit the vaccine station in March or April to see the process in action: ‘since such medical students are the future medical practitioners, I think it would further their interests in vaccination to see the method followed.’[56] Hurley set out the various steps in manufacture that the students might see.[57] The original suggestion was from the Deputy Director-General of Health, Joseph Frengley. It is not recorded if any students or Hercus took up the offer, but he is likely to have visited at some stage to learn the skills he needed to manage a vaccine station in the grounds of the Seacliff Mental Asylum near Dunedin in 1925. The calves needed for making the vaccine were available from the farm that was part of the complex. Director, Dr Truby King had established a large milking herd at Seacliff around the turn of the century.[58] *The Evening Post* reported Hercus’s appointment:

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[56] Joseph Frengley to John Hurley, August 3, 1921. ADBZ 16163 H-1 Box 1294 129/4/10 alt.no. 9141 (R20954064) Bacteriological Laboratories – Wellington Vaccine Station, Archives New Zealand.

[57] Ibid., John Hurley to Director-General of Health, August 15, 1921.

[58] Shearer, “Typhoid in Seacliff Mental Hospital.” Shearer noted that there was a herd of 100 milking cows at Seacliff milked in two separate byres in 1938. He determined who the typhoid carrier responsible for the outbreak was and how he believed he had spread the infection. Although the milk supply was ‘not perfect’, it was not likely to have been involved.

> Now that it has been decided to hand over the Wellington bacteriological laboratory to the Wellington Hospital Board, the Health Department has decided to establish a new vaccine station at Seacliff on the Mental Hospital property. The vaccine station is to be placed under the direction of Professor Hercus, of Otago Medical School, and Government Bacteriologist at Dunedin, who will in future control the preparation of vaccine.[59]

For this work, Hercus needed to use his bacteriological experience and management skills in manufacturing the vaccine. It is not clear who carried out the work but a note exists to say that Hercus (or two of his students) was carrying out tuberculin testing at Seacliff (though it does not specify if this was of humans, the milk supply, the calves or all of these) and visiting the vaccine station regularly.[60] It is likely that Hercus was able to use the venture to give his students practical skills in bacteriological testing. The government may have established the Seacliff station as a backup to the Wellington Vaccine Station following Hurley's resignation in 1925. There were problems with maintaining the vaccine station *in situ* and the desire of the Hospital Board to appoint 'an officer to carry out the duties of a pathologist and

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[59] "New Vaccine Station," *The Evening Post*, May 4, 1925, 5.

[60] Lindo Ferguson to Dr Elliott of the Medical Council, Wellington, 22 December 1925. ARC-0913 94-121/8 (1922). Ferguson was considering weekend-long visits to Seacliff by final-year students to see the cases and learn what could be picked up from them, and used the example of Hercus and his Preventive Medicine students already visiting the hospital. There are accounts for board and lodging at Seacliff for 67 students at 12/- each, in the Dean's Files for 1925, indicating that these weekend visits did take place.

bacteriologist.'[61] During 1928, the government built a new vaccine station in Wellington, the DSIR taking over the old buildings but there is no mention of the station's producing anything other than vaccine lymph.[62] Philip Lynch was appointed Acting Director.

There does not appear to be any surviving documentation on the Seacliff station, or for how long it functioned. The Wellington laboratory used very few animals – up to 12 in any one year –and presumably, the Seacliff operation was smaller. In addition to working on his goitre study, carrying out his role as Sub-dean and encouraging other research projects within the School, this duty to supply vaccine for the government is likely to have made his life very busy.

It is difficult to believe that Hercus was not involved in some way with some unusual research at Seacliff in 1925 when his colleagues used blood from a patient with malaria to treat three patients. He was considered an expert on the disease following his work in Jordan in the First World War.[63] Hercus's colleagues, pathologists D'Ath, Lynch and John U. Williams induced malaria in three cases of

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[61] "Hospital Staff," *The Evening Post*, May 21, 1925, 9.

[62] P.P. Lynch to Director-General of Health, April 11, 1928. ADBZ 16163 H-1 Box 1294 129/4/10 alt.no. 9141 (R20954064) Bacteriological Laboratories – Wellington Vaccine Station, Archives New Zealand.

[63] Bernard Freyberg, "Time moves on," *NZMJ* 50 (1951): 184-85. Comenting on the incidence of malaria in the 2nd N.Z.E.F. he said, 'We had thought out the malarial problem and if we wanted help, we had an arrangement to fly to Egypt Sir Charles Hercus, who had great experience in the first war and was an authority on malarial prevention.'

general paralysis of the insane held at Seacliff.[64] A young Assyrian girl admitted to Dunedin Hospital with malaria provided the blood sample required for infecting the patients. The one patient referred to in this note experienced very high fevers having caught malaria, which later responded to treatment with quinine. With some further drug therapy, the patient was declared fit and discharged. None of these researchers was still an undergraduate and carrying out their dissertations, but the following year Hercus's students contributed important findings on a worrying outbreak of diphtheria.

Investigating diphtheria: the Kaitangata outbreak in 1926

Although the investigation into the epidemic of diphtheria at the South Otago township of Kaitangata started as a student exercise, it grew to involve two District Health Officers, a Commander-Surgeon of the Royal Navy, and Hercus himself. It stands as an example of one of Hercus's student projects that resulted in discoveries that were to have practical implications for preventive medicine. There were two serious unusual outbreaks of diphtheria in the 1920s in Kaitangata, some fifty miles south of Dunedin. Diphtheria was a significant cause of death of young children in New Zealand up until the 1930s despite the availability of the diagnostic Schick reaction, treatment with diphtheria anti-toxin and immunisation with diphtheria toxin-

[64] J.U. Williams, "A note on the treatment of general paralysis by inoculation with benign tertian malaria," *NZMJ* 24 (1925): 67.

antitoxin (TAT).[65] The Schick reaction was not perfect and improving it created a research project for Hercus and a succession of his students.

From 1921, Hercus arranged for his fifth-year students to test and immunise children in outbreaks of the disease occurring within a reasonable distance of the Medical School. This was a year before the first officially reported immunisation of children carried out by an officer of the School Hygiene Division of the Health Department in Hamilton.[66] Generally, parents were apathetic and the officers had great difficulty in persuading them to get their children immunised, but things were different once an outbreak occurred as at Kaitangata.[67]

This outbreak occurred in March and April, some months into the university year by which time most fifth-year students would have largely completed the practical work for their dissertations. Hercus's students Henry Campbell Barrett and John Havelock North planned to travel to Kaitangata on 11 April, however, 'to study the effects of isolation on [the] immunity' of the local population for their dissertation.[68] There they proposed Schick testing all the children whose parents consented to the procedure and then to immunise positive reactors. Later they would return to test the immunity of these children. The students prepared for the trip, diluting the toxin as

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[65] The Schick test involved injecting diphtheria toxin into a subject's arm and measuring the response three days later. A reddened injection site indicated that the subject had not encountered diphtheria before – a positive reaction.

[66] Maclean, *Challenge for health*, 356.

[67] Annual Report of the Director-General of Health, *AJHR* 1927, H-31, 49. Shore wrote: 'practically all the parents readily gave consent' to immunisation of their children.'

[68] C.E. Hercus et al., "An epidemiological study of diphtheria in a remote New Zealand Community," *Journal of Hygiene* 29 (1929): 248; Barrett and North, "A study on diphtheria."

required for the testing and proceeded to Kaitangata. To their consternation, they found far fewer positive reactions than expected, based on previous studies carried out by Hercus and their fellow students. Only 40 percent of the children (not the expected 80 percent) gave positive results and these were faint and hard to read.

Visiting Dunedin at this time was Commander-Surgeon Sheldon Dudley, of the Royal Navy, serving on the H.M.S. *Dunedin* as Squadron Medical Officer. An expert on diphtheria epidemics, he stepped in to help the students read the Schick test results and later assisted Hercus in preparing his paper.[69] Hercus, with his military background no doubt had much in common with Dudley.[70] On July 24, 1925, *The Auckland Star* had publicised Dudley's research into the spread of diphtheria in ships and schools to help explain the Health Department's new policy of offering free inoculation to school children in selected schools in Auckland.[71] From April to December, approximately 1100 children were immunised in New Zealand, most not being Schick tested first, 'except in Otago, where medical students carried out treatment under the supervision of School Medical Officers.'[72]

On returning to Dunedin, Barrett and North carried out experiments to help understand the epidemic and consulting Hercus to help them analyse and prepare to publish the results. They concluded that the diphtheria toxin used to test the children had lost potency because of extreme shaking during the three-hour trip over very poor

[69] Dudley had been Professor of Clinical Pathology at the Medical School at Greenwich and was an experienced bacteriologist. Hercus referenced some of his studies when co-writing Barrett and North's paper.

[70] "Medical Research," *The Evening Post*, November 26, 1945, 6.

[71] "Diphtheria in schools," *The Auckland Star*, July 24, 1925, 5.

[72] *AJHR* 1926, H-31, 40.

roads. Far from being complete, however, the students' study was not over: a second outbreak of diphtheria occurred in the area in October/November. Barrett and North returned to Kaitangata and carried out more testing, this time diluting the toxin on-site and achieving more expected results – they found that over 60 percent of those children who did not test positive in April would have done so if the students had used a potent toxin.[73]

The first Kaitangata epidemic was 'undoubtedly air-borne and took place chiefly in the school class rooms', but the second, more virulent outbreak, was spread in milk supplied by one of the two milkmen in the district, whose family had been 'harbouring diphtheria' for several months.[74] Hercus regretted that adults were not included in the testing in April:

> It is a great pity a fair sample of adults could not have been included for comparison, for while the children for the most part were born and bred in Kaitangata, many of the adults had emigrated there, and hence should have been more immune.[75]

Hercus used the students' work to write a comprehensive paper, with Dr Robert Shore, Medical Officer for Southland, and Commander Dudley, which was published

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[73] Hercus et al., "Diphtheria epidemiology," 252.

[74] Ibid., 247.

[75] Ibid., 251.

in the *Journal of Hygiene* three years later.[76] Shore, who was by 1927 working in Wellington, had written a report of the epidemics, which omitted any reference to the students' or Hercus's involvement.[77] This preliminary report lacked the analysis that the authors carried out before publication in 1929. They alerted readers to the practical problems in handling diphtheria toxins and carrying out Schick tests.[78] They also explained why they believed that the immunisations carried out by the students largely failed in a group retested in the second outbreak. This occurred even though the students followed the same procedure as Hercus had used successfully on children in Dunedin orphanages.[79]

The Kaitangata experience was unusual and besides providing Hercus and his students with a practical exercise in epidemiology, it offered a cautionary example for future researchers. It suggested a plan of action and to know what to look for 'in the lucky event of [an investigator] ever again meeting with a similar combination of circumstances.'[80] Hercus and his co-authors recommended spending more time in immunising 'remote unsalted communities' and repeated testing of those already inoculated. Those people who were immune to droplet infection in a day school

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[76] Ibid, 258. Hercus invited Professor Greenwood, the newly appointed Professor of Epidemiology and Statistics at the London School of Hygiene and Tropical Medicine, to examine the statistical tables for accuracy before publication.

[77] Hercus and Shore did not appear to have had a harmonious relationship: they disagreed on goitre studies in the 1930s.

[78] Hercus et al., "Diphtheria epidemiology," 243-58.

[79] Roger Bakewell and Reginald Bonnington, "A study of the Schick reaction on school children" (Unpublished Student diss., University of Otago, 1925).

[80] Hercus et al., "Diphtheria epidemiology," 258.

environment may not be able to withstand massive doses of diphtheria bacilli in milk. This episode is an example of how Hercus applied his research: he used his findings to give practical advice at a time when it was unclear how imperfect the early vaccines were.

Other diphtheria research aided by Hercus's students

Leading up to the Kaitangata diphtheria outbreak, several students had completed their dissertations on the incidence of the disease in school children in Dunedin and surrounding areas. In 1925, Robert Bakewell and Reginald Bonnington tested and immunised 304 pupils in three Dunedin primary schools and an orphanage.[81] They investigated the environmental causes of the disease, concluding that healthy surroundings, fresh air and maximum sunlight reduced the incidence. Henry Fitzgerald and Cedric Isaac tested and immunised 484 children in Mosgiel and Oamaru schools in 1926, following up outbreaks in 1924 and 1925 in these areas.[82] They also report testing their classmates. By 1928, students had learned the lessons about caring for the test toxin and Frederick Chisholm and John Mercer emphasised how they cared for it before using it on 447 pupils at three Dunedin primary schools.[83] All these students reported difficulty with getting parental consent to test and immunise their children. Blaming parental and teacher ignorance on the advantages of

[81] Bakewell and Bonnington, "Schick reaction."

[82] Henry Fitzgerald and Cedric Isaac, "Schick test and toxin-antitoxin injections for diphtheria; with short notes on two epidemics of diphtheria" (Unpublished Student diss., University of Otago, 1926).

[83] F.R. Chisholm and J.O. Mercer, "A Study on active immunisation in diphtheria" (Unpublished Student diss., University of Otago, 1928).

vaccination, they recommended that the Department of Health prepare more propaganda to encourage a better uptake of immunisation against diphtheria.

Hercus estimated that the immunisations carried out by his students did reduce the incidence of diphtheria as evidenced by a decline in 1927-29. Hercus halted the immunisation work temporarily in 1928 when 12 out of 21 children died in Bundaberg, Australia after inoculation from a bacterially contaminated batch of toxin-antitoxin.[84] In New Zealand, School Medical Officers had been carrying out non-compulsory immunisation of children in some schools since 1925, but stopped on the direction of the Department of Health at this time.[85] Immunisation programmes resumed in the 1930s.

An alarming increase in the virulence of diphtheria occurred in the early 1930s in many parts of the world, as well as in Dunedin, where Hercus and bacteriologist Harold Wilson reported on seven fatal cases.[86] Hercus and Wilson analysed the Dunedin Hospital data of cases admitted between 1921 and 1931. These showed a worrying trend with quite a few instances of illness in people over 15 years old – conventional wisdom claimed the disease was prevalent in younger children. Wilson, a pathologist with experience in two Australian hospitals found that the Dunedin cases were extremely malignant. Massive injections of antitoxin failed to save the patients. Hercus and Wilson concluded that it was futile to give such patients usual doses

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[84] C.E. Hercus and Harold Wilson, "Diphtheria in the Dunedin Hospital: A statistical and clinical study," *BMJ* 2 (1932): 872; Anon., "Diphtheria immunization: the Queensland fatalities," *BMJ* 2 (1928): 1076.

[85] "No More Deaths," *The Evening Post*, January 31, 1928, 8.

[86] Hercus and Wilson, "Diphtheria in Dunedin," 874.

(40,000 to 10,000 units) of antitoxin and half a million or more units might save those in desperate straits.[87] Eighty-two infected patients survived. Hercus and Wilson believed the increased mortality was due to an exceptionally malignant type of disease.

The Dunedin outbreak in 1930-31 showed two different types of disease, the more severe type being associated with a morphologically distinct bacillus, possibly *B. diphtheria gravis*, which had been isolated overseas. The formula for the special medium for its identification did not reach New Zealand until after the outbreak. Hercus also contrasted the seasonal fluctuations in diphtheria incidence with that of other countries. It was greater in summer in New Zealand but lowest in Europe, America, Africa and Japan. Diphtheria incidence did not show as great a drop in winter as it did in Australia, which also showed a summer peak. He suspected the climatic conditions held the answer but did not investigate further. At least one child died in the 1930-31 outbreak, and her illness was reported in detail in the paper.

Two of Hercus's students investigated whether infected tonsils might be causing diphtheria, as suggested by some doctors and whether the advice given by Medical Officers of Health for tonsillectomy for children as a preventive measure was justified.[88] In 1933, students Frank Hutter and Neil Hardie found that '[the number of children being immunised is] insufficient to make us secure against the possibility of a serious epidemic … [we need] at least 70 percent of the children under five years of age to be protected.' Fortunately, the disease was becoming less common.

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[87] Ibid., 873.

[88] Frank Hutter and T.P. Hardie-Neil "Tonsillectomy and its relation to diphtheria and scarlet fever," (Unpublished Student diss., University of Otago, 1933).

Tonsillectomy did lower the incidence of diphtheria, but because of the reduced prevalence, surgery was not justified on this account, they concluded.

By 1945, the vaccine had changed to ‘toxoid A.P.T.’ (alum-precipitated toxoid) and Hercus’s fifth-year students were seeing pupils at the Medical School’s health clinic. Three students visited a Dunedin school and tested 279 pupils but could achieve only 59 immunisations because parents objected and were openly hostile in some cases.[89] The students’ diphtheria dissertations complemented the work of the Department of Health officers in that the students carried out a lot of the testing and immunisations. The whole procedure took several visits and required great care in managing sterility of the equipment and of the solutions. The students gained valuable experience in medicine and in interacting with the public. They also provided Hercus with important epidemiological data for his own use and for other health workers.

Hercus provided a considerable service to the public by providing testing and immunising school children with the help of his senior students and gained insight into this infectious disease through their dissertations. The uncertainty of the quality and efficacy of the vaccines and the later unexplained virulence of the bacterium made this work difficult for Hercus and his students hoping to educate and protect the public.

Hercus’s investigation into hay fever

While the foregoing research projects were on proven or suspected bacterial or viral infections and hence within Hercus’s specialty of ‘bacteriology’, his study into the

[89] W.B. Craig, J.F. Hare and T.A. Hurrell, “Diphtheria prophylaxis: immunisation of George Street School, Dunedin” (Unpublished Student diss., University of Otago, 1945).

causes of hay fever concerned the health effects of agronomists' efforts to improve pastures for stock. Between 1892 and 1940, New Zealand imported a huge range of grasses to sow new pastures outdoing all other countries in this, according to Alfred Cockayne.[90] By 1925, nearly three quarters of the occupied land was now grassland sown with multiple species with the potential to cause hay fever. The sheer number of possible causative species 'adds much to the difficulties inherent in the study of hay fever,' said Hercus.[91]

Hercus began a study of hay fever in New Zealand in the mid-1920s, perhaps as a response to a paper in the *New Zealand Medical Journal*, which reported a speech given by T.H. Patterson, an instructor in the Department of Agriculture.[92] Patterson suspected that pollens from imported grasses were causing the complaint and explained that 'much experimental work, however, needs to be done, and it can be performed by New Zealand medical men.'[93]

As Hercus had done with his goitre study, he co-ordinated a large study across the whole country, setting up a research group with Cockayne from the Department of Agriculture to provide pollen charts from across the country and a number of doctors willing to test their patients with locally sourced pollen extracts. There were overseas-manufactured 'hay fever reaction outfits' available for testing and treating patients but they were not always useful in New Zealand conditions and at times lost potency after

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[90] C.E. Hercus and E.F. D'Ath, "Notes on hay fever," *NZMJ* 27 (1928): 356.

[91] Ibid.

[92] T.H. Patterson, "The pollination of grasses and trees in the Auckland Province and the occurrence of seasonal hay-fever," *NZMJ* 23 (1924): 7-18.

[93] Ibid., 14-15.

months at sea. Scientists had developed methods of making pollen extracts and how to perform scratch tests on patients by 1922, so the challenge for Hercus was to fine-tune the process for New Zealand's situation. Hercus said in 1928:

> Some three years ago, in response to requests from various members of the profession throughout New Zealand, extracts from those pollens which were found to be most commonly concerned in the genesis of hay fever were prepared for the use of the profession.[94]

Hay fever research gained public attention in New Zealand when American asthma and hay fever expert, Dr George Piness attended the NZBMA meeting in Dunedin in February 1927. At this congress, Hercus was very busy promoting his goitre work, but he no doubt gained insight into the current thinking on hay fever from Piness, who publicly stated that it was possible to cure hay fever.[95] Hercus did not endorse this at any time in his work, taking a precautionary stance in 1931:

> Several cases are recorded of immunity persisting to two seasons after two or three years of treatment, but whether it is possible to obtain permanent relief is at present beyond our knowledge. From our own experience such a happy result does not appear very probable.[96]

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[94] Ibid.

[95] "Nasty Ailments," *The Evening Post,* February 1, 1927, 10.

[96] C.E. Hercus and M.N. Watt, "Hay fever in New Zealand," *NZMJ* 30 (1931): 361.

The first public hint of Hercus's work on hay fever appeared in the *Appendices to the Journals* in 1928, reporting that in late 1927 Hercus had set Charles Hector the task of studying grass pollens microscopically and making a card index of local species' distribution, prevalence and time of pollination.[97] He also had other staff and students collecting data and Cockayne providing data from the Auckland, Wellington, and Canterbury districts. Hector established that exposing specially prepared pollen-plates systematically throughout the pollen season was the best method to use to sample air-borne pollens.

Hercus and former student, pathologist Eric D'Ath, wrote a comprehensive paper on how they performed scratch tests on 230 patients using twelve common pollens.[98] For the benefit of other doctors, they explained how to perform the simple tests and how to interpret the results. They concluded that the worst offending plants were cocksfoot, sweet vernal and two rye grasses. They also gave a scheme for treating patients with decreasing doses of extracts of the pollens over a 16-day period, either pre-seasonally or seasonally. The treatment gave 92 percent of the patients some degree of relief but Hercus and D'Ath concluded that they had still much left to unravel in the mechanism of immunisation in hay fever patients and that this paper was merely an introduction.

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[97] Annual Report of the Director-General of Health, *AJHR* 1928, H-31, Appendix Part 1, 4 and 68.

[98] Hercus and D'Ath, "Hay fever," 1928; "Otago University," *The Evening Post*, January 5, 1929, 13. D'Ath wrote his MD thesis on hay fever in New Zealand, so the study with Hercus may have been part of this work. He was appointed to the chair of Pathology at the Medical School in late 1928.

The research continued under Hercus with an in-depth study of the Dunedin area to correlate the load of pollen in the atmosphere with the incidence and severity of hay fever in patients. The project involved assessing meteorological factors and perfecting pollen-collecting methods. Dr Morris Watt, lecturer in bacteriology, worked with Hercus on this project, which showed that the city experienced a heavy cloud of grass pollens each year between November and March, though the date range sometimes varied with the season. They also enlisted the help of 85 doctors from throughout the country and received funding from the Department of Health. The results appeared first in the *Appendices to the Journals* in 1929 and then in more detail in *The New Zealand Medical Journal* in 1931.[99]

Hercus and Watt passed on instructions for doctors to follow to carry out the tests, warning them of adverse reactions, exciting factors such as exposure to salt water or bright light. Although grasses were the worst offenders, Hercus and Watt identified certain other plant pollens to be aware of as allergens, but those borne in the atmosphere were the most important. Hercus did not publish any more papers on hay fever, but two of his students completed their dissertations on the subject in later years, indicating perhaps that he still had an interest in the condition.[100] One of these, Stephen Taylor, thanked Hercus for help in completing his project in 1950.[101]

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[99] Hercus and Watt, "Hayfever in New Zealand," 351-64.

[100] Armstrong, "Suggested scheme for a comprehensive study of atmospheric grass pollens"; Stephen Taylor, "Hay fever in New Zealand with special reference to causal plants and notes on ragweeds" (Unpublished Student diss., University of Otago, 1950).

[101] Taylor, "Hay fever in New Zealand."

Hercus's Bacteriological and Public Health Department was producing test kits of pollen extracts for sale to medical practitioners, possibly from as early as 1923.[102] An alternative treatment in the days before antibiotics was 'non-specific protein therapy,' as already mentioned in this thesis concerning rheumatoid arthritis.[103] In addition to the pollen products, Hercus's Department produced compounds for use in this therapy, though perhaps for only a short period: Hercus was reportedly very much opposed to the procedure. One of his students wrote in his dissertation that proponents claimed that the procedure acted 'as a general "push-up" [to] the sick body and impel it to fight disease.'[104]

By 1945, the School was obtaining pollens from the Plant Research Bureau of the Grasslands Division of the DSIR to use in its test kits. Fifth-year student Dengate Robert Armstrong, who worked in the Bureau during the long vacation in 1949-50, was very critical that it offered only 11 species of grass pollen not only to the Medical School but also to Hospital Boards and private practitioners.[105] He felt the employees of the Bureau work were doing the work 'as a mere favour, disrupting their routine

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[102] University of Otago Bacteriological and Public Health Department: The Specific Treatment of Hay Fever. (undated document) ARC-0187/75 MS-1745/004. The pollen extracts for diagnosis cost 10 shillings a set of 18 plant pollens – not all were from grasses. There were also phials of each in a range of concentrations for treatment. The Department also produced some other products, 'Catarrhal Vaccines for prophylaxis and treatment of the common cold', mixtures of *Bacillus bulgaricus* and *B. acidophilus* for 'sour milk therapy', and most surprisingly, ampoules of a peptone solution prepared according to Dr Auld's formula for 'non-specific treatment of asthma.'

[103] Rolleston, "Rheumatoid arthritis," 896.

[104] "Sunshine Therapy," *The Evening Post*, December 8, 1927, 23.

[105] Armstrong, "Suggested scheme."

and research work.'[106] Unusually, Hercus left critical comments on this dissertation, disagreeing with some of the student's conclusions.

In 1950 Taylor updated Hercus and Watt's 1931 statistics relating to the importance of different grasses in causing hay fever.[107] He found that cocksfoot was less of a problem due to the reduction in planting as cities had grown, noting that it was unsuitable for lawns and playing fields. Despite the introduction of anti-histamine preparations, there was a continuing need for pollen desensitisation, he wrote. He noted that:

> The Medical School laboratories have supplied practitioners through the years with diagnostic pollen extracts and the antigen solutions for therapy. In addition they have given medical men the benefit of expert consideration and advice on the problems presented by the individual case. In this work Otago has undoubtedly led the field.… There remains much work to be done, however, before the picture is complete.[108]

It is unclear when the provision of hay fever test kits ended but research into agricultural topics continued with Hercus progressively taking on research into hydatid disease helped again by his students and their dissertations.

Hercus and hydatid disease

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[106] Ibid.

[107] Taylor, "Hay fever in New Zealand."

[108] Ibid.

In addition to working on his endemic goitre project, Hercus actively supported Dunedin Hospital's surgeon Sir Louis Barnett's research into the detection and prevention of hydatid disease. The eggs of the tapeworm, *Taenia echinococcus*[109] infected humans through contact with farm dogs, which had eaten infected offal. The eggs hatched into embryos and travelled through the human body, lodging mainly in the liver where they formed cysts. Barnett, also a lecturer at the Medical School (and later Professor of Surgery) had run the project at the School since 1891, following the death of child he had operated on for a hydatid cyst.[110] As in similar countries with huge sheep numbers, the hydatid tapeworm flourished in New Zealand, causing monetary losses in export of sheep livers, estimated in 1937 to be as much as $50,000 per year.

Barnett, later Professor of Surgery, kept a record of the incidence of hydatid disease throughout New Zealand and published the results regularly in the *New Zealand Medical Journal* and occasionally in daily newspapers. He also published case studies of his surgery to remove often-massive hydatid cysts. Doctors were unable to diagnose the condition accurately before undertaking surgery, which was fraught with complications such as haemorrhaging and bacterial infection. The disease mimicked numerous other conditions and surgeons feared finding an unsuspected hydatid cyst, which if disturbed, could cause the death of the patient. 'Hydatid surprise packets presented to view in the operating theatre and post-mortem

[109] *Taenia echinococcus* was later reclassified as *Echinococcus granulosis.*

[110] L. Barnett, "Hydatid disease: prevalence and prevention" *Proceedings of the University of Otago Medical School* 1938, unpaginated.

room are within the experience of most New Zealand and Australian practitioners,' wrote Barnett in 1930.[111]

Although by the late 1920s, radiologists could sometimes find hydatid cysts in patients, the technology was not foolproof: the country needed a suitable pre-operative non-invasive diagnostic test, as well as a public prevention programme.[112] Farmers should stop feeding infected sheep offal to dogs and everyone should wash their hands after handling dogs. Hercus and his students worked hard over the years to promote the cause and he was to spend several of his years in retirement on the project.

Hercus began a comprehensive study of using the immunological 'complement fixation test' for diagnosis and treatment as early as 1921.[113] Italian researchers had used the test from 1907, but it was not until the early 1920s that researchers began to apply it in Australasia. 'In Australia its application was worked out by N.H. Fairley, and in New Zealand, independently, by Hercus,' wrote Carmalt Jones.[114] A positive test would show hydatid antibodies in body fluids of suspected cases. The researchers had to find a suitable antigen from the hydatid tapeworm to use in the test. Hercus found that the best material was that freshly collected from the infected sheep, not a very practical solution, however. In addition, the test was accurate in only 58.2 percent of the cases tested and often gave pseudo-positive and negative results.

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[111] L. Barnett, "A collective study of hydatid disease in Australia and New Zealand," *NZMJ* 29 (1930): 236.

[112] D.W. Carmalt Jones, "Hydatid disease as a clinical problem," *BMJ* 2 (1929): 7-8.

[113] C.E. Hercus, "Laboratory aids in the diagnosis of Hydatid Disease," *NZMJ* 25 (1926): 326.

[114] Carmalt Jones, "Hydatid disease," 7.

Hercus believed that the lack of a strong host-parasite reaction, which would have produced antibodies in the blood, caused these reactions. He concluded that the test was useful for finding cysts left in the body after surgery. The test proved its worth in making correct diagnoses in some cases which had previously been diagnosed as possible cancers or pulmonary tuberculosis: 'A study of this series illustrates the extraordinary mimicry of the disease, and the value of laboratory tests in differential diagnosis', wrote Hercus after analysing the results of 43 cases.[115]

The work was a combined effort within the School and two of his former students, Drs Eric D'Ath and Philip Lynch carried out much of the routine immunological work for Hercus's 1926 paper. Hercus also evaluated the Casoni Reaction as a test for the presence of hydatid cysts and Dr Waldon Fitzgerald carried out trials of the test on patients in the hospital for him. This test, eventually adopted as routine in New Zealand hospitals at this time, again used hydatid material, which was prepared for intradermal injection into a patient's forearm. The researchers developed an extract to use from infected sheep lungs and livers, which they filtered and stored in capsules on ice, and which would retain its potency for up to six months. An injection of peptone into the patient's other arm provided an important control. A positive reaction was the appearance of a wheal, which spread rapidly and was followed by a greater reaction six-to-twelve hours later when it would become extremely painful and extensive, and taking several days to disappear.

Hercus found that the Casoni Reaction was of most value 'in the pre-operative diagnosis of primary cases of hydatid disease, and particularly in those uncomplicated

[115] Hercus, "Laboratory aids in the diagnosis of Hydatid Disease," 328

cysts, which other immunological methods fail to detect.'[116] He recommended other members of the profession should consider using the technique for its simplicity and accuracy in pre-operative hydatid disease. He also appealed to them for more data with regard to all the tests he had covered in his paper. Although the disease was serious, it was not particularly common, which helped make diagnosis difficult for surgeons. Carmalt Jones reported doctors consulting him and referring their patients from throughout the country in 1929.[117] Barnett reported that Hercus had experimented with using the Casoni skin reaction on dogs before 1929 but failed to get a recognisable response, but had better success with using the complement fixation test.[118] Would it be practicable to subject all country dogs periodically to such a test and to deal with them medicinally according to their blood reaction? Barnett wondered. It would appear that this was not considered seriously, as this seems to be the only reference to this animal study. By this date, the Department of Agriculture was evaluating arecoline hydrobromide as a treatment for hydatid disease in dogs. It proved effective and simple to administer as long as the farmer was diligent in using it.

In the same issue of the *New Zealand Medical Journal* that featured Hercus's paper, Roland Fulton, Medical Registrar at the Dunedin Hospital published statistics for 1914-25 showing totals for each year did not exceed 15 in Dunedin and ranged

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[116] Ibid., 334

[117] Carmalt Jones, "Hydatid disease," 8-9.

[118] L. Barnett, *Hydatid disease in New Zealand: its prevalence and prevention* (Sydney: Australasian Medical Publishing Company, 1929), 11.

from 63 to 90 per year throughout the country.[119] For a comparison with Australian figures, Hercus provided figures of one hydatid patient per 549 total patients in public hospitals for the ten years, 1915-1924. Australian statistics ranged from 1/294 in Victoria to 1/2900 in Queensland.[120] These were cases admitted to hospitals and the numbers may not have represented re-admissions, unreported cases, or patients with infections discovered only on autopsy.[121] Children were more likely to become infected but typically would not show symptoms for many years.

Several of Hercus's students chose to study hydatid disease and the earliest seems to be Cyril Williams who helped confirm hydatid infestation in a child suspected of having tubercular peritonitis.[122] He examined the child's blood for increased white blood cells, which, although a simple test is not specific, and followed it with a complement fixation test. Surgery confirmed the infection. Later students were able to dose farmers' dogs and carry out Casoni Tests on farmers as part of their projects.[123] The students did not always encounter farmers willing to have their farming or personal hygiene practices examined and appeared to have been treated with

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[119] R.A.H. Fulton, "Hydatid Disease in man," *NZMJ* 25 (1926): 317-23.

[120] L. Barnett, "The incidence of hydatid disease in New Zealand," *NZMJ* 33 (1934): 193-4.

[121] D.D. McCarthy, "The epidemiology of *Echinococcus granulosis* in New Zealand," *NZMJ* 56 (1957): 207.

[122] Ibid., 325. This dissertation, carried out in 1922, is not held in the School's collection.

[123] L. Sanson, "Control of hydatid disease in New Zealand: a survey of the New Zealand methods to 1952" (Unpublished Student diss., University of Otago, 1952). He claimed that there had been 26 earlier dissertations on hydatid disease.

suspicion by farmers in the Hawkes Bay area.[124] Hercus was always thanked for his 'untiring assistance and kindly criticism' by the students, who often struggled to educate the famers. Former students I have interviewed stress his caring attitude towards them and interest in their projects, leading some to take up a career in medical research. Perhaps the students attempting to instruct farmers about hydatid disease in the 1930s and 40s may not have always been very tactful in their approach, and certainly a few proclaimed that the farmers were quite ignorant of the disease and its prevention.

In 1934, students Charles Begg and Graham Riley visited five large sheep stations in the Upper Clutha area, one of them belonging to a relative, and appeared to enjoy the experience of 'adding to the small amount of data that has already been published on the subject of the hydatid tapeworm and its cycle.'[125] They tested the farmers and farm workers with Casoni tests: 'The Casoni tests proved to be a popular feature of our work and excitement would run high while the 20-30 minutes elapsed before the expected result.'[126] None of the tests was positive. By 1934 tablets of the vermifuge, arecoline hydrobromide were available and the students dosed all the dogs on the different farms, again much to the interest of the farm workers who saved offal for them to study. They examined the 'fluid excreta' from the dosed dogs using a hand

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[124] Cumming, D.G. and Macgregor, J.H. "Epidemiology of hydatid disease: Hawkes Bay, New Zealand" (Unpublished Student diss., University of Otago, 1937). The students wrote that they had to convince the famers that they had no connection with the government before they would co-operate.

[125] A.C. Begg and C.G. Riley, "Hydatid disease: a public health survey" (Unpublished Student diss., University of Otago, 1934).

[126] Ibid., 23.

lens or preserved it for microscopic study, and found a 60 percent incidence in the dogs. They carried out a practical study of farming practices related to preventing the disease, observing possible routes of infection, and passing on this information to the farmers.

To help the students carry out dissertations on hydatid disease, in 1936 Hercus produced instructions for carrying out the task and a farm inspection form for them to complete. This may have been an attempt to standardise the reports and/or a response to feedback about earlier unhappy encounters with farmers. He recommended that students query the Stock Inspector of the district on his knowledge of hydatid disease, and that they should visit the local abattoirs or freezing works as part of their project. This much more disciplined approach meant that the students needed to have done some personal study into the lifecycle of the tapeworm and the way the infection spread to humans, before they could ask how much farmers knew about it. They had to observe hand-washing and other hygiene measures taken by the farmers and their families, which could appear intrusive and needed tact. 'We studied the farmer as much as the disease', commented Cumming and Macgregor in 1937. Farmers did not always co-operate with the students' requests but sometimes allowed them to dose the farm dogs. Cumming and Macgregor noted that as the famers did not suffer any financial penalty for sending diseased stock to slaughter, they were not interested in preventing infection – such a tax might change their minds.[127] In a second dissertation from 1937, Allan Alexander and John Webber noted that Hercus had proposed 'a fine of 3d per head for every sheep slaughtered that is infected with hydatid disease is the

[127] Cumming and Macgregor, "Hydatid disease in Hawkes Bay."

only scheme that will affect every single sheep farmer. The only factor that is universally effective is a pecuniary loss.'[128]

Hercus had suggested this levy in an address he gave to the Australian and New Zealand College of Surgeons at their meeting in Auckland in January 1937.[129] 'Raw offal from sheep must never be fed to the dogs. If this universal practice could be stopped to-morrow, hydatid disease could be eradicated from New Zealand in ten years.' He calculated that in the first year of such an imposition, the country could collect £50,000 that could be used to finance hydatid disease research.

The students spread the message about preventing hydatid disease using propaganda prepared by Hercus and Barnett and the Department of Agriculture, in the form of pamphlets and posters. The students reported to Hercus that the pamphlets were more effective than posters but sometimes even they were ignored: 'and we left with the feeling that those pamphlets that we distributed would probably be put, as Sir Louis Barnett once stated, "to an ignoble use."'[130] Hercus gave a radio talk on the disease in 1930 and addressed interest groups, such as the Timaru Agricultural and Pastoral Association in 1934.[131] He noted that over 2800 people had been treated for hydatid disease in New Zealand in the last 37 years and that 450 of these had died. Hydatid disease affected cattle as well as sheep and the incidence in the South Island was greater than in the North. He banished the commonly held belief that humans

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[128] I.A. Alexander and J.H. Webber, "A survey of hydatid disease in central Hawkes Bay with particular reference to farm hygiene in its control," (Unpublished Student diss., University of Otago, 1937).

[129] "Fine the farmer!" *Auckland Star*, January 20, 1937, 5.

[130] Cumming and Macgregor, "Hydatid disease in Hawkes Bay."

[131] "Hydatid Disease," *The Evening Post*, December 19, 1934, 19.

could catch hydatid disease by eating infected meat – contact with infectious dogs was the only source of infection.[132]

Barnett set up a Hydatid Registry covering Australia as well as New Zealand in 1935.[133] In 1934, he had appealed for funding for research and donated £1000 towards establishing a Department of Hydatid Research within the School.[134] Hercus's role was to assist 'on the laboratory side', with pathologist Morris Watt and E.W. Bennett, and his students were to give practical instruction and dog testing and dosing. In January 1937, Barnett addressed the Annual Meeting of the ANZAAS in Auckland:

> Some two years ago, the nucleus of a Department for Hydatid Disease Research and Prevention was instituted at the New Zealand Medical School under the direction of Dr. C.E. Hercus, Professor of Public Health, Dr. E.F. D'Ath, Professor of Pathology, and Sir Louis Barnett, emeritus Professor of Surgery. … [It is] administered by the University of Otago and is financed partly by Government grants and partly by contributions from the New Zealand Meat

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[132] "What We Eat," *The Otago Daily Times*, May 16, 1894, 3. This is a very early example of such misinformation. On discovering hydatid cysts in sheep plucks (liver and lungs) at a butcher's shop, the Dunedin mayor sent them for analysis to Professor Black at the Otago University. The professor validated the discovery and issued a warning to people that eating the infected meat could cause hydatid disease and a butcher could spread the infection on his knives to other products.

[133] L. Barnett, "Hydatid disease: a note on the incidence in New Zealand for the year 1936,"*NZMJ* 36 (1937): 241-44. The registry was set up under the auspices of the Royal Australasian College of Surgeons and provided data for doctors preparing papers for publication.

[134] L. Barnett, "Hydatid disease, research and prevention," *NZMJ* 34 (1935):140-1.

> Producers Board, Farmers' Unions, Dunedin Savings Bank, the Medical Staff of the Dunedin Hospital, and some generously minded individual donors.[135]

The hydatid work was absorbed into one of the first research committees set up within the new MRC at Hercus's instigation in late 1938. For more than ten years, Hercus pushed for a better organisation of medical research in New Zealand. He increased the pressure in 1937 in his address to the Australian and New Zealand College of Surgeons in Auckland.[136] He focused on the need to eradicate hydatid disease, advocating the use of shock tactics to stop farmers feeding raw offal to dogs. If a fine of 3d on every infected sheep sent to market were collected, it would provide a £30,000 fund to carry out hydatid research.[137] In the same talk he said:

> In New Zealand we have yet no medical research council, no medical research institute, no annual Government endowment. It is true that we have several endowments from private benefactors and from the British Empire Cancer Campaign, but none is adequate. In striking contrast is the amount of attention which has been applied to industrial and agricultural research. … The position is anomalous. Organised research into the causes of the diseases of man has had to give preference to problems confronting agriculture and industry. … The

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[135] L. Barnett, "Hydatid disease prevalence and prevention," *NZMJ* 36 (1937): 105.

[136] Hercus, "George Adlington Syme Oration," 18.

[137] "Fine the Farmer!" *The Auckland Star*, January 20, 1937, 5.

establishment of an institute of medical research where fundamental problems can be investigated is essential.[138]

Hercus is likely to have believed that giving this prestigious address would aid his aim of setting up a medical research council in New Zealand. As noted earlier in this chapter, newspaper reporting focused more on the remarks he made about poliomyelitis than about hydatid disease, however. The conference was held in January 1937 and by March Hercus was Dean of the Medical School, a very important and prestigious role in New Zealand at the time. Later that year he was involved in setting up the first MRC, by a process discussed in detail in the following chapter.

For the next ten years, Barnett continued to report on the incidence of hydatid disease and to suggest investigative and surgical methods for surgeons to combat the infection. His Hydatid Registry provided statistics for clinical research, incorporating details collected in Australia. He contrasted the New Zealand experience unfavourably with that in Iceland where legal compulsion had achieved definite success.

For years past the Research and Preventive Medicine Departments of the Medical School, with the co-operation of the Government Departments of Health and Agriculture, have carried out an extensive, intensive and expensive campaign of education and persuasion. No other hydatid country in the world has attempted this effort on such a scale. … We claim that our campaign … has

[138] Hercus, “George Adlington Syme Oration,” 18.

> been thorough, but has it been effective? That is the important question, and the answer, I regret to confess it, is "not yet."[139]

The early 1940s brought restrictions to the research project, in staff numbers of government departments, shortages of paper for printing propaganda, reductions in funding and reduced displays at agricultural shows. Supplies of arecoline were also in short supply. The research into hydatid disease carried out at the School included studying the morphology and natural history of the parasite and the efficacy of arecoline and other anthelmintics, but the focus was largely on that of prevention through public awareness. In addition, there was a large field trial of arecoline in the Ranfurly district of Otago.[140] Barnett died in 1946 and the MRC Committee for Hydatid Research went into recess, its campaign work being handed over to the Government Departments of Health, Agriculture and Education.[141]

Hydatid research continued within the MRC from 1956

Hercus, referred to as 'a moving force in the battle against hydatid disease,'[142] reconstituted the MRC's Committee for Research into Hydatid Disease Committee in 1956, calling hydatid disease 'the most important parasitic disease in New Zealand.'[143] Citing the conclusions he had derived from 'field studies by certain fifth

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[139] Louis Barnett, "The incidence of Hydatid Disease in New Zealand," *NZMJ* 40 (1941): 277.

[140] M. A. Gemmell, "The Styx Field Trial," *Bulletin of the WHO* 56 (3) 1978: 433-43.

[141] C.E. Hercus, "Hydatid Disease in New Zealand," *NZMJ* 56 (1957): 68.

[142]Neil C. Begg, A. Charles Begg and Richard G. Robinson, "Primary Hydatid Disease of the brain – its diagnosis, radiological investigation, treatment and prevention," *NZMJ* 56 (1957): 98.

[143] Hercus, "Hydatid Disease in New Zealand," 67.

year medical students carried out during the last 25 years, he gave the reasons for the failure of the campaign to control the disease as ignorance and apathy. Also implicated were scepticism of the efficacy of the available methods of control, the presence of large numbers of unregistered dogs and that arecoline did not kill the eggs or worms, meaning that frequent disinfection of the material voided by the dogs was needed. Few people knew of the existence of the regulations added to the Meat Act, banning the feeding of raw offal to dogs. All these factors contributed to his re-forming the committee, which had its first meeting in December 1956. Hercus felt so strongly about eliminating hydatid disease that on retirement in 1958, he continued working on the project in new facilities (one-half of a disused aeroplane hangar) on the Taieri Plains, which had been purchased for the project. He reported in 1962, that the research team was investigating methods of killing the hydatid eggs.

There is much more to the New Zealand hydatid story than can be included in this thesis. I have not mentioned many of the other researchers involved, but there are books and articles on the subject as well as a History Master's thesis by Honor Anderson.[144] Her thesis is comprehensive and well informed, covering as it does the complete story of the incidence and eradication of the hydatid tapeworm in New Zealand. This thesis focuses mainly on the role that Hercus played, his encouragement of his students to help and his own research efforts. Hercus's interest and involvement lasted nearly a lifetime and other writers have recognised his contribution. He advanced the state of epidemiological knowledge through the work of his students and

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[144] F.S. Maclean, *Hydatid Disease in New Zealand* (Wellington, National Hydatids Council, 1964); Honor Anderson, "Hydatids: A disease of human carelessness. A history of human hydatid disease in New Zealand" (MA diss., University of Otago, 1997).

kept the topic in the public arena through assisting publicity campaigns and within the two MRCs, which he helped to establish and organise. The School's hydatid research exemplifies the inclusive nature of Hercus's research, involving many different organisations, government departments and possible funding agencies. He was not content to restrict the research to the laboratory and led publicity campaigns to help eradicate the disease. In addition, he shared statistics with Australian colleagues, a prime example being his contribution to Harold Dew's 1928 text book, *Hydatid Disease: its pathology, diagnosis and treatment.*[145]

Conclusion

In all of these projects begun before 1937, Hercus was a driving force, using his students to increase his research personnel at little cost while increasing their practical experiences of public health and preventive medicine. He was continuing the culture of research begun in the School, which was in advance of that of Australian medical schools at the time. Both countries saw the establishment of scientific and industrial research organisations ahead of medical research at university medical schools but at Otago, Hercus and others persisted and expanded their research to improve public health. This period was one in which Hercus began building up a research base at the School in conditions other than endemic goitre, establishing networks among medical personnel, scientists and politicians.

Poliomyelitis, diphtheria and smallpox were not diseases peculiar to New Zealand and were the subject of universal research efforts but Hercus was able to produce

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[145] Harold R. Dew, *Hydatid Disease: its pathology, diagnosis and treatment* (Sydney: Australasian Medical Publishing Company, 1928): 39.

some useful results that allowed him to advise other researchers on pitfalls they might experience, especially in the care of vaccines. His students also learned some valuable lessons through assisting in the vaccination of school children and studying the epidemiology of the disease within New Zealand. The use of monkeys as experimental animals brought Hercus into contact with people and organisations opposed to animal research. Unfortunately, the results of the experiments were not successful and it was to be another decade before the techniques for culturing viruses developed that Hercus had needed in the mid-1920s.[146]

The hay fever research was to reveal the influence of imported grasses on health and offered a chance for the School to provide a service for physicians to use in the form of test kits and treatments. The challenges were many in this agriculturally dependent land where the soils were proving to be deficient in minerals for the health of men and farm animals alike. Animal diseases were spreading to the human population in the form of hydatid disease, bovine tuberculosis and leptospirosis, all of which Hercus would lead research into in the next few years. He supported Barnett's work on hydatid disease in this period through helping produce propaganda posters and leaflets as well as appearing at agricultural shows to promote safe handling of sheep offal to prevent the spread of the tapeworm.

All these projects occurred or began before the government came to the aid of the School by providing funding via the MRC for medical research, the subject of the next chapter. The NZBMA had failed to get support from the government to establish

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[146] Anon., "Pathological Society of New Zealand," *NZMJ* 35 (1936): 32. By late November, 1935, Hercus was able to demonstrate to the Sixth Meeting of the Society how to carry out 'the new technique of culturing viruses on living egg membranes and [exhibit] a number of examples.'

a medical research institute, which would have been located preferentially at the School, but now the country had a DSIR. Hercus was to work with scientists from various divisions of the DSIR in his aim to eliminate preventable disease in New Zealand.

Chapter Six: Private funding and the Medical Research Council

> *New Zealand has not been backward in following the advances of medical science, but appears to be rather behind the recent strides in the study and treatment of cancer, and this will be rectified by the co-operation of the public, the medical profession and the Department of Health.*—Anon., 1929[1]
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> *Sir Charles made the most of any opportunity to foster research*.—F.N. Fastier, 1968[2]

Introduction

As the 1930s advanced the worst of the depression lifted as the economy began to recover and the Labour Party, elected in 1935 began its welfare reforms. 'In a tremendous burst of legislative activity in 1936-38 and another in 1945-46 Labour transformed the state into the Welfare State.'[3] The 1938 Social Security Act introduced a national health service that provided medicines, medical treatment, maternity benefits and family allowances, paving the way for an increase in the birth rate, which had fallen as a consequence of the depression years. Marriage rates had also fallen as people could not afford to marry and have a family. In 1876-80 the birth rate was 41.21 per 1,000 of population but by 1934 it had fallen to only 16.47 per 1,000.[4]

In 1940, Hercus focused his *Wilding Memorial Lecture* on finding ways to increase the population through preserving the lives of mothers and children, particularly emphasising the prevention of tuberculosis, which often affected women in their reproductive years.

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[1] Anon, "Editorial," *NZMJ* 28 (1929): 120.

[2] F.N. Fastier, "Sir Horace Smirk: Professor Emeritus," *NZMJ* 67 (1968): 258.

[3] Keith Sinclair, *A history of New Zealand*, 278.

[4] *The New Zealand Official Year Book, 1936* (Wellington: Government Printer, 1936), 71.

Throughout the 1930s the government rapidly reduced funding for medical research because of financial constraints so that for the year 1932-1933 only £10 was allocated and only £8 for 1934-35.[5] In 1926, at the height of Hercus's study into goitre and infectious diseases, the sum had been £2,597.

Hercus campaigned to maintain and increase research into tuberculosis prior to his becoming Dean in 1937. In 1946 he successfully obtained the majority of the funding available from the Travis Bequest, which had been set up for research into cancer and tuberculosis, to carry out tuberculosis research at the School. This restricted the funding available from the bequest for cancer research by The British Empire Cancer Campaign Society, which established a laboratory in the School. The Society brought its own substantial funding to support its research workers, but their project suffered from lack of integration within the School and it only just survived through the war years. Under Hercus's influence cancer research thrived with the appointment of Dr Franz Bielschowsky in 1946.

With the establishment of the first MRC in 1937, Hercus was able to incorporate existing research into the different committees comprising the council. The move to have the MRC at the School cemented medical research in Dunedin, bypassing the efforts of Watt to found a medical institute in Wellington. The new structure meant new staff members were needed and Hercus played a major role in employing scientists with a proven record of accomplishment in research. He also showed foresight in taking on brilliant refugee scientists from Hitler's Germany, despite anti-German feelings in New Zealand during wartime. At the same time as he took on these scientists he had to deal with an increasing number of refugee doctors wishing to migrate to New Zealand and retrain at the School.[6]

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[5] "Supply," *NZPD*, August 28, 1936: 763.

[6] Page, *Anatomy of a medical school*, 118-120; Caswell, "Refugee medical practitioners.

His own research efforts played a reduced role as his duties as Dean of the Medical School increased but he remained well informed of all the research and frequently published papers of the achievements. His role became more administrative and he travelled quite extensively, publicising the School and its research, as well as looking at international research establishments. The thyroid research widened and changed and the different research committees' work often overlapped. The Second World War brought new areas of research as the country faced shortages of essential food items, such as citrus fruit and fish oils, leading to researchers discovering local alternatives.

Spurred by Hercus's attendance at two important scientific conferences in Britain in 1946, a research committee was set up to study the health of Pacific Islanders under his chairmanship. In this chapter, I will cover the somewhat disputed origins of the MRC and the work of the Thyroid and Tuberculosis Committees.

Who should benefit from the Travis Bequest?

Having failed to secure a medical research insititute for the School in 1926, Hercus saw an opportunity to gain funding when Christchurch businessman Henry Travis died in June 1927 leaving approximately £40,000 for medical research. Less than one month after this became known, Hercus and Drennan announced that they believed the endowment 'should form the valuable nucleus of a national institute of medical research.'[7] Such an institute should be not only affiliated with the School, but also with the Medical Research Council of Great Britain, the Department of Health and practising members of the profession. In response to public disquiet about the lack of suitable facilities for such an institute, the professors replied that there were well-equipped laboratories in each of the main centres. The Minister of Health, the

[7] "Cancer and T.B.," *The Auckland Star*, July 18, 1927, 9.

Hon. J.A. Young supported the Otago bid for carrying out research in response to criticism that 'medical research work had never been encouraged by the Department of Health and that, beyond doing a little in regard to infantile paralysis, it preferred to watch what other countries were doing.[8] Young detailed the projects underway at the School and by 'field inquiries made by medical officers in the service of the Government.' Researchers at the School co-operated closely with the Department, which helped finance much of this research. The government's policy of subsidising the donations pound-for-pound had increased earlier bequests for cancer research in 1925, allowing Dr John Fulton to visit hospitals throughout the country to gather data on cancer cases.[9]

The Travis Bequest was specifically for research into consumption *and* cancer. It was most unlikely that any single researcher would be able to study both illnesses and this wording was to cause much discussion and even court cases to resolve. Much of the criticism levelled at the practicality of using the Travis Bequest was aimed at cancer research, but Hercus and Drennan noted that 'the Imperial Cancer Research Institute had already approached New Zealand asking for research into the incidence of cancer in the Polynesian race, and into the duration of cancer in Europeans living under this country's special conditions.'[10]

The discussions did not seem to come to anything until London surgeon and cancer expert Mr Sampson Handley attended the NZBMA conference in 1929 with the prime objective of

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[8] "Travis Bequest," *The Evening Post*, July 22, 1927, 10.

[9] "University Bequests," *The Evening Post*, July 22, 1925, 9. £1000 was given by the widow of H.A. Massey, £100 from a Wellington man and £100 from the Wellington Hospital Board, which made a total of £2200 for the work. Fulton may have presented this study as his student dissertation with Stanley Wilson in 1927, but it has not survived in the Medical Library collection.

[10] "Cancer and T.B.," *The Auckland Star*, July 18, 1927, 9.

setting up a New Zealand branch of the British Empire Cancer Campaign Society ('Cancer Society').[11] At a conference convened by the Minister of Health the following week to discuss 'what steps could be taken to assist in combatting the scourge of cancer', Watt reported on the supply of radium in the country and on current surgical capacity in the hospitals, as well as the availability of £1000 for research from an Invercargill benefactor. When he followed this with 'then the Travers (sic) bequest (Christchurch) amounted to £60,000', Hercus counteracted with, 'That bequest has only now become available, but a large sum has been dedicated for death duty.'[12]

At the conclusion of the conference, Hercus seconded a motion to set up 'a provisional committee to arrange the preliminaries of the inaugural meeting' of the proposed Cancer Society. Hercus was not on this committee. The Travis trustees began supplying radium and radium needles to the North Canterbury Hospital Board but could not anticipate establishing a cancer research laboratory with the funds available.[13] By October 1929, the NZBMA reported that divisions of the Cancer Society were being formed in the chief cities and that 'a competent researcher had been engaged to commence work' in the most obvious place, which was 'the laboratories already provided at the Medical School in Dunedin.'[14] The researcher chosen was Dr Andrew Begg, an Otago graduate in 1920. He had been researching cancers caused by viruses at the Imperial Cancer Research Institute in Britain. As one of his

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[11] "Cancer Control," *The Evening Post*, February 27, 1929, 6.

[12] Ibid.

[13] "Travis Bequest," *The Evening Post*, April 20, 1929, 15.

[14] Anon., "Cancer Research," *NZMJ* 28 (1929): 310.

priorities, Begg was to supervise the statistical committee comprised of 'the Dunedin members,' which included Hercus.[15]

Hercus attended a meeting of the 'central committee' of the Cancer Society in Wellington on August 28, 1930 at which it was decided that the various divisions of the Society should contribute in equal shares to the laboratory work at the School, while each division would be responsible for local cancer clinics, radium purchase and individual activities.[16] The editorial writer added that all lay and medical people should play a part 'at least by giving money.' The Society was very active and successful in soliciting funding through street collections and public appeals. The provision of so much money for research into cancer in a virtually un-integrated laboratory within the School is likely to have made Hercus's other research projects seem very poorly supported.

Hercus's research into cancer

In 1933, perhaps in response to the publicity of the Cancer Society's work and to correct the impression that the Medical School was not actively investigating cancer, Hercus and Purves published a paper on student cancer studies, with fifth-year student R.D. Keenan.[17] Hercus and Purves claimed that New Zealand offered a most favourable field for the intensive study of heredity and cancer because of its small and homogeneous population. Between 1926 and

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[15] "Cancer Research," *The Auckland Star*, August 28, 1930, 20. These may have been Sir Louis Barnett, Drs D'Ath, Riley, Hercus and Newlands, who attended this meeting.

[16] Ibid.

[17] Anon. "Cancer treatment and research in New Zealand," *JAMA* 92 (1929): 1467. In this editorial summarising Sampson Handley's visit, the writer stated that comparatively little had been done in cancer research in New Zealand; C.E. Hercus, R.D. Keenan and H.D. Purves, "Collective investigation into cancer from the public health aspect," *NZMJ* 32 (1933):1-20.

1931, six pairs of Hercus's students had completed studies on the preventive aspect of cancer on 380 cases at the Dunedin Hospital. In 1932, Hercus became aware that a much larger number of Norwegian medical students had carried out similar study on 6,000 cancer cases occurring since 1908 looking for evidence of heritability of cancer. These students concluded:

> After a careful analysis of this vast quantity of data, with due consideration of possible errors, it is concluded that it is proper to assume that this statistical study of known cancer records indicates that hereditary disposition does constitute a factor in the etiology of cancer.[18]

Although the Otago team could not compete with the scale of the Norwegian study, the fact that they even attempted it was remarkable. Hercus and Purves correlated the different forms of cancer with family histories of cancer and noted the common factors operating in the development of the cancers. The Otago study was only preliminary they wrote and suggested that the Cancer Society could take a lead and continue the work, after all the Society had the necessary organisation and machinery with which to do the work.[19] They hoped that the publication 'might be of interest' to the Society, but there is no evidence that Begg or the Society accepted the challenge at the time.

Hercus kept New Zealand cancer research alive by encouraging two more of his students to analyse the existing data in 1933 to study 'the significance of sunlight as a causal agent in

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[18] Anon., "The influence of heredity on cancer," *JAMA* 98 (1932): 1656.

[19] Ibid., 6.

cancer of the skin.'[20] The students collected cancer statistics from the Government Statistician and correlated them with geographical areas and Meteorological Office data, finding that exposure to sunlight was of considerable importance in aetiology. The highest incidence was in outdoor workers in the Hawkes Bay, possibly as expected, but the incidence in Nelson was inexplicably low. The students had found incomplete hospital records could be responsible for this anomaly. Hercus not only suggested the topic to the students but also helped them considerably with 'criticism and advice' to complete their survey. Nowhere in the dissertation did the students offer any practical suggestions on how to avoid skin cancer and it is not clear if this study was publicised.

Despite these efforts to maintain cancer research, funding was a problem. On a brief visit to Dunedin in 1935, Murray Drennan found the funds available for cancer research to be 'fairly ample', but the contrast with the financial struggle facing goitre and hydatid research was too great.[21] After all, cancer was a 'world' problem and Begg's research was not unique to New Zealand, as Hercus's goitre research was. Drennan commented that, 'he was shocked to hear that the highly-qualified [goitre] investigator could not be guaranteed the wage paid to an unskilled labourer. Were it not for the energy and enthusiasm of Dr Hercus, this work would have ceased entirely long ago.'[22] This inequality must have coloured Hercus's and others' feelings about the cancer research project. Again, Drennan called for a medical research institute to be set up in New Zealand.

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[20] Boyd-Wilson and Hill, "Significance of sunlight as a causal agent of cancer of the skin." Anomalies in data collected at hospitals did not help the students' work and the finding that the Nelson area had fewer cases of skin cancer than Otago was a concern to them.

[21] "Special problems: goitre and hydatids," *The Evening Post*, August 30, 1935, 10.

[22] The researcher was probably Purves.

Begg and Hall's cancer research

Although working under difficulties and seemingly with little support from Hercus, Begg and his associate William (Bill) Hall investigated some fundamental aspects of cancer cytology at the School. These included 'all the ferments of normal and malignant cells – proteolytic, glycolytic, and nuclear – using cryoscopic and titration methods … [and] radiations [of tumour cells] by means of the ionising effects they may have, using an electroscope to measure this.'[23]

Begg's first review paper on cancer research contained little information on his New Zealand studies. In 1937, he published a paper explaining how he induced tar cancer in mice and examined the resulting hypertrophy of the affected skin microscopically to follow the involvement of sclerotic connective tissue in the production of cancer.[24] The following year he wrote a more accessible and useful paper on practical methods to improve the treatment of malignant growths.[25] He emphasised the importance of keeping lymphocytes active and explained how to maximise the effect of radium on cancer cells.

In 1950, Hercus noted that the cancer research laboratory was 'the first overseas branch of the Society to establish and maintain research laboratories,' and scarcely mentioned Begg's achievements, but he and Bell comment favourably on the work of Franz Bielschowsky, Begg's successor, in *The Otago Medical School Under the First Three Deans*.[26]

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[23] A.M. Begg, "A review of cancer research," *NZMJ* 30 (1931): 1-8.

[24] A.M. Begg, "The role of connective tissue in the genesis of cancer," *NZMJ* 36 (1937): 3-13.

[25] A.M. Begg, "Cancer Campaign: suggestions for better treatment of malignant growths," *NZMJ* 37 (1938): 147-52.

[26] Hercus, "New Zealand and medical research," 111; Hercus and Bell, *The Three Deans*, 179. It is not clear which author actually wrote this comment.

Purves claimed that Begg was treated quite poorly at the School, being given accommodation that was nothing more than a corner of a large empty room in the Physiology Department, *not* as Carmalt Jones recorded, 'a laboratory and an office'[27] in the Department to carry out his research.[28] Begg was unhappy working at the School, Purves thought, and believed that his appointment was ultimately a disaster.[29] There was no future for a one-man research effort within the School, and Begg encountered a hostile environment causing him not to return from a term of study leave in 1938 at the Imperial Cancer Research Institute in Britain.[30] In 1948, Begg resigned but maintained contact with his technician, Hall, who carried on the research programme in the School. Hall, who had come to Dunedin with Begg in 1930, had brought some 'randomly bred' mice from Mill Hill in England in 1930, maintaining them separately from the School's animals. These were to be important in breeding experiments for cancer research by later researchers.

Tuberculosis research

Although by 1937, Hercus had not received funding from the Travis Bequest to extend his tubercle-typing programme, he persisted, even going so far as to challenge the trustees in court. The original trustees found it difficult to allocate the funding and had allocated only

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[27] Carmalt Jones, *Annals*, 230.

[28] Purves, "Twenty years before the Act," 43.

[29] Ibid.

[30] "Cancer research," *The Evening Post*, October 22, 1941, 8. Begg went to Britain in 1938 to visit laboratories, and in 1941 carried out military duties in England, while still finding time to continue important cancer research at Mill Hill; Purves, "Twenty years before the Act," 43. Begg did not return to New Zealand; Hercus and Bell, *The Three Deans*, 179: Hercus recorded that Begg resigned in 1948 and Franz Bielschowsky took over the laboratory.

£300 per annum from an income of £2000 by 1935, largely for the purchase of radium by the Cancer Society. In one way, this was actually an advantage in that the accumulated money was to provide 'a more secure financial base to support more substantive research in later years.'[31] When the last surviving trustee relinquished his role, new trustees were appointed under a revised scheme in 1938. One of these was Hercus's old friend and colleague, Hand Newton at Christchurch Hospital.[32]

Hercus attended the first meeting of the new trustees in Christchurch in April 1938. He persuaded them to give '£2,000 per annum for ten years to cover the salary of a qualified man, to be selected by the Otago University Council, to research tuberculosis.'[33] In releasing their decision in December 1938, the trustees commented:

> The Trustees feel that the obvious place for such research is at the great Medical School and the University in Dunedin, and this is the reason why this body has been chosen. There, the physiologist, and bacteriologist, the physicians, and others all work in close touch and co-opt help, if required, from any branch of the faculty. Such conditions exist in no other town in New Zealand.[34]

In December 1938, Hercus announced the trustees' decision:

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[31] John Wilson, *William Henry Travis 1853-1927, the W.H. Travis Trust 1927-1987* (Christchurch: The Trust, 1987), 11.

[32] Hercus and Hand Newton worked together at Christchurch Hospital in 1914 and served together in the First World War. Hercus was an attendant at Hand Newton's wedding in 1920.

[33] Wilson, *The Travis Trust*, 13; "Campaign against Tuberculosis," *The Otago Daily Times*, December 16, 1938, 12. This report claimed the award was for seven years.

[34] "Campaign against tuberculosis," *The Otago Daily Times*, December 16, 1938, 12.

> This has been the most outstanding year as far as medical research at the Medical School is concerned.… I feel that in placing their resources in the national medical school they have been equally sound, as this will secure the full co-operation of the whole teaching staff and extensive library facilities. Altogether there will be a happy collaboration between the teaching and resource branches. Teaching and research are natural affinities, while the university atmosphere supplies a grasp of the principle that is required in the prosecution of any fundamental work.[35]

An anonymous editorial appearing in *The Otago Daily Times* commented a few days later:

> [The decision marked] a notable contribution … to the campaign for the eradication and prevention of disease [and it is] a gratifying recognition on [the trustees'] part of the standing and importance of [the Medical School]. Medical research is becoming in increasing measure a feature of the activities of the Medical School, which has, of course, a national status, with the enlargement of its value to the community.[36]

The Tuberculosis Research Department began operation on February 1, 1940, with the trustees paying the salaries of two research fellows and making an annual grant of £250 for equipment and materials on top of an initial grant of £700 for equipment. Hercus was now able to direct the research into 'a study of the life history and nutritional requirements of [the] tuberculosis bacillus and the reaction of host to parasite,' and to correlate the experimental

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[35] "Medical Research," *The Evening Post*, December 17, 1938, 14.

[36] "Medical Research," *The Otago Daily Times*, December 17, 1938, 14.

work with clinical observations.[37] At another meeting that year the trustees reworded the proposal, giving the director, Dr Noel Edson, a salary of £1000 to carry out the research as well as giving £400 for an assistant and £500 for equipment.[38]

Edson's first paper was a statistical study of mortality from tuberculosis in the Maori Race.[39] This was a topic also covered by Health Department officers and in particular, by Dr Turbott in 1935, who studied the incidence in East Coast Maori.[40] Turbott consulted Hercus in prosecuting the survey, thanking him for his 'help and criticism in planning the investigation, for the typing of cultures, and for [his] sustained interest.'[41] Hercus is likely to have shared his experiences on working with Maori families in a similar area to that where he had worked over the summer of 1924-5.

Hercus was not satisfied with the share of the Travis Bequest that the School was getting, after all, tuberculosis research was of a fundamental nature and Edson had shown himself to be a researcher who could discover a cure or treatment. (This was in contrast to the Cancer Society's work, which Hercus believed was unlikely to result in a cure and really was not of a fundamental type, as specified by the bequest.) Hercus's new plan was to obtain funding for senior and junior research fellows, an assistant, and a technician and for plant and equipment

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[37] "Medical Research," *The Evening Post*, December 17, 1938, 14.

[38] Edson was a New Zealand medical graduate who had studied biochemistry under Krebs at Cambridge. He returned to Otago as part-time lecturer in the Physiology Department as well as director of the Travis Laboratory. Edson became the first Professor of Biochemistry in the School in 1949.

[39] N.L. Edson, "Mortality from tuberculosis in the Maori Race," *NZMJ* 42 (1943):102-10.

[40] Bryder, "A new world," 327.

[41] H.B. Turbott, *Tuberculosis in the Maori, East Coast, New Zealand* (Wellington: Department of Health, 1935): 5.

over the period 1947-53. This would take all the available money and there would be no money left to continue the grant to the Cancer Society.

There was a problem in that the wording of the bequest was very vague on apportionment, so Hercus with the University of Otago and the Cancer Society sought adjudication from the High Court in Christchurch in 1946. The trustees had already been to court in 1936 to try to understand the loosely worded will. In the 1946 case:

> Dr Edson and Sir Charles Hercus argued that with Maori tuberculosis rates among the highest in the world and with tuberculosis a disease that affected the young, potentially productive members of society and required long, expensive treatment (unlike cancer which was a disease of advancing years), the need for research into tuberculosis was pressing.[42]

The judge, after deciding that the case had been brought under the wrong Act, interpreted the will as allowing the trustees to authorise 'such regulations and conditions as regards the application of such income as to them shall seem expedient.'[43] The trustees were thus able to able to ensure funding from the Travis Bequest for tuberculosis research at the Medical School until the 1960s and the laboratory named as the Travis Laboratory.

This episode had been quite unfortunate and not finished when the court case ended. In 1947, Hercus challenged an attempt by Sir James Elliott, chairman of the NZBECCS, to

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[42] Wilson, *The Travis Trust*, 15. Hercus was not knighted until 1947, after the case was heard.

[43] Travis (Deceased), Young and others v. Otago University and another, New Zealand Law Reports 1947, 382-91.

recommend appointment of new trustees for the Travis Trust.[44] These would include a representative of the MRC, another from the Cancer Society, one from the Tuberculosis Association and one other trustee. It appears that Hercus had not been consulted that Elliott had approached the Trust with this suggestion and clearly did not approve. Elliott had conferred with Watt, late chairman of the MRC. The committee voted against making these changes.

Research in the Travis Laboratory included investigating a case of human tuberculosis caused by an avian tubercle bacillus – a first for New Zealand.[45] Other research investigated the frequency of infection with bovine form of tuberculosis infections and yet another focus was the cultivation of tubercle bacilli and analysing the metabolism of mycobacteria.[46]

The New Zealand Medical Research Council: a somewhat disputed origin

There is some argument over just who set up the first MRC – whose idea it was and who carried it out but it was most likely to have been a combined effort by Hercus, Watt and others at the Department of Health, as well as the government. Participants at a conference held at the Department of Health in October 1936, discussed how to initiate and establish

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[44] Annual Report of the Medical Research Council, May 20, 1947. ADBZ 16163 H1 Box 1569 240/1/7 (R20960285) Archives New Zealand.

[45] Margaret K. Finlayson, "A case of human tuberculosis due to avian tubercle bacilli," *NZMJ* 44 (1945): 362-7.

[46] Margaret K. Finlayson and N.L. Edson, "Extra-pulmonary tuberculosis," *NZMJ* 46 (1947): 184-9; N.L. Edson and G.J.E. Hunter, "Respiration and nutritional requirements of certain members of the Genus Mycobacterium," *Biochemical Journal* 37 (1943): 563-71.

medical research on a 'satisfactory footing.' [47] They concluded that 'the Hon. the Minister should recommend to set up a Medical Research Committee under whose control and on whose advice the various investigations would be conducted.' Hercus was not at this meeting, which Marsden and Andrew from the DSIR attended as well as Directors of divisions of the Department of Health. Hercus had however, submitted several suggestions for discussion regarding goitre research that formed a large part of the proceedings. The other subjects considered were dental caries, nutrition and surgical tuberculosis. While there is debate about the origins of the MRC, Purves was clear about Hercus's role:

> In 1937 I heard that Sir Charles Hercus' request for the formation of a Medical Research Council along the lines of the United Kingdom's Medical Research Council was about to be granted by the Labour Government then in power. Economic conditions had been improving since 1935, and the Labour Party was sympathetic to University expenditure.[48]

Other commentators acknowledged Hercus's input: J.V. Hodge wrote '… in 1937 [Hercus's] advocacy, together with a sympathetic officialdom, resulted in the formation of a Medical Research Council along the lines of its English counterpart.'[49] G.B. Peterson said:

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[47] "A conference on medical research held at the head office," Department of Health, on Wednesday, October 21, 1936. ABLQ W4147 105/ 210/3 (R419784) Archives New Zealand.

[48] Purves, "Twenty years before the Act," 44.

[49] Hodge, "Fifty years of health research," 450.

In 1937, Sir Lindo Ferguson was succeeded as Dean by Charles Hercus, whose vision and encouragement was to lead to a revitalising of research activity in the Medical School. Even more importantly, Hercus was successful in persuading the government of the day to establish a Medical Research Council in New Zealand, and the benefits of the funding from this source were quickly felt.[50]

Yet another writer credited the Minister of Health, Peter Fraser, with its formation.[51] Michael Watt, then Director General of Health claimed it was his own achievement, writing: 'In 1937 I persuaded the government to agree to the formation of the Medical Research Committee – it was soon to be known as the Medical Research Council – and to set aside a small annual sum for expenditure on research.'[52]

During a debate on passing a bill to give a much better structure to the Council in 1950, Leader of the Legislative Council, the Hon. Mr Polson supported Watt's claim, at first fulsomely, but later more realistically perhaps, suggesting that establishing the MRC was 'partly' due to Watt's efforts.[53] It seems unquestionable that Hercus played a big part in establishing the Council, despite Watt's claim.

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[50] G.B. Peterson, "Biochemistry," in *Medical Research in Otago 1922-1997 as portrayed by 75 years of the Proceedings of the Otago Medical School*, ed. Edwin Nye (Dunedin, Otago Medical School Research Society, 1998), 24.

[51] W. H. Cooper, "Medical research in New Zealand: the role of the Medical Research Council," in *Medical Research in New Zealand: Working Party Report*, ed. Eric M. Nansen (Dunedin: The Council, 1975), 117.

[52] Michael Watt, *The rest of the day to myself*, 1957. MSY-3874 Alexander Turnbull Library, 95. A Medical Institute did eventuate in the early 1950s in Wellington, sometime after Watt's retirement. By this time, the MRC was firmly in place at the Medical School and the Institute offered no competition.

[53] "Medical Research Council Bill," *NZPD*, August 23, 1950: 1779.

Hercus was to host at the School all but two of the research committees that constituted the MRC. His existing projects formed the nucleus of the Council. Watt later announced that he wanted medical research work for his medical officers of health to carry out in Wellington, which would have been in direct competition with the Medical School and Hercus, its Dean.[54] Wellington did eventually get a National Health Institute, but not until after Watt retired in 1952. It opened officially in 1954.[55]

Hercus was adamant that medical research was best carried out within the School and made his point later at the Empire Science Conference of 1946:

> Any attempt to direct the main stream of research from universities to special institutes was considered to be prejudicial to sound development. The best men should be kept in university medical schools where they should take some part in teaching. … The internal control of policy as regards the methods and scope of research, the personnel engaged, must be left in the hands of any institution to which a research grant is made. … There was agreement [within the conference] that medical research should not come directly or completely under the control of the Department of Health. It was significant that throughout the conference as a whole there was a strong feeling that fundamental research should not be tied up too closely with so-called "user" departments. *Ex-officio* membership of the departmental head with the research council and general close liaison was though to the sufficient to ensure on the one hand the results of research

[54] "Public Health," *The Evening Post*, August 13, 1940, 8.

[55] D.T. Stewart, *Pathology in Wellington: public and national health, hospital, academic and private* (Christchurch, s.n., 1994): 6.

being more fully known to those who had to apply it and on the other that the research workers were kept in touch with practical needs.[56]

Hercus wrote this after the MRC had been in operation for nearly a decade, by which time he was looking to change its structure. In 1938 though, most of the early projects taken up by the MRC were on public health issues that crossed over with the work of the Department of Health. This mutually beneficial arrangement meant that the Department could take up and enact any recommendations arising from the research. The statistics gathered by the research teams added to those that Health Officers were able to collect. As the years passed and the research became more scientific and specialised this association was not as close. In particular this was seen in the tuberculosis research which was largely epidemiological until the Department of Health set up its own Tuberculosis Division (in 1943), and research could focus on biochemical aspects of Mycobacteria.[57]

The structure of the MRC

Modelled on the British MRC, the MRC aimed to correlate, as far as was practicable, medical research in New Zealand: to recommend which investigations should be undertaken, and to appoint separate *ad hoc* committees to take charge of these investigations. [58] The Council was set up as a committee of the Department of Health, and was not a statutory body. Without

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[56] T. Rigg, C.E. Hercus and E. Marsden, "The Empire Science Conference, 1946," *New Zealand Science Review* 5 (1947): 11-12.

[57] Peterson, "Biochemistry," 24.

[58] C.G. Drake to L.S. Hearnshaw, June 26, 1947. ABQU 632 W4415 Box 514 245 alt. no.55247 (R1877226) Medical Research General, Archives New Zealand; "Medical Research," *The Evening Post*, January 24, 1938, 10.

corporate status, the Council could not accept donations, bequests or endowments and could not provide continuity for employees. Reconstitution of the MRC in 1951 remedied this major failing. Purves later commented that: ‘It was then [in 1949] revealed that the MRC had a congenital defect, having been born, so to speak, with a hole in the constitution. In truth it had no constitution at all as there had not been in 1937 any act of creation by which such bodies acquire legal existence.’[59]

The Council as set up in 1937/38 was to recommend a budget and to apportion the amount to each committee. Members met at least once a year in Wellington usually in May and sometimes in Dunedin in about September as well. The Council comprised two representatives of the Faculty of Medicine: Hercus and Dr Muriel Bell; two from the NZBMA – Sir Donald McGavin and P.P. Lynch; two medical men chosen by the government – Sir James Elliott and Dr R.R. Milligan; two Departmental representatives – Dr E. Marsden (head of the DSIR), and Watt, who acted *ex officio* as the chairman. Of this group, Hercus was well acquainted with Elliott and McGavin through military circles, especially when Hercus took over the running of the OTC in 1923.[60] Lynch and Bell were colleagues. Milligan had worked as an assistant in the Physiology Department at the School between 1921 and 1923 where he carried out research into the effect of drugs on the mammalian heart.[61]

Hercus reported that Peter Fraser attended the first meeting of the Council in December 1937 where he indicated ‘the active interest of his government in the field and [suggested] that in the meantime research should be concentrated on subjects of vital concern to New

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[59] Purves, “Twenty years before the Act,” 45.

[60] Lindo Ferguson to Lord Liverpool, April 19, 1923, ARC-0193 94-121 (1923).

[61] Carmalt Jones, *Annals*, 182.

Zealand.'[62] The research committees focused on local health issues and began at different times over the next 12 years; war delayed progress when personnel were absent and others had a chequered existence for other reasons. The full list of committees was: Cancer, Clinical Medicine, Dental, Goitre (later Thyroid), Hydatid Disease, Island Territories, Psychiatric, Neurophysiology and Neuropathy, Nutrition, Obstetrical, Tuberculosis, Virus and Immunology, and eventually 'Microbiology', formed as an amalgamation of the Hydatid Disease and Virus and Immunology Committees.

The inaugural investigations were into hydatid disease, nutrition, goitre, dental diseases and tuberculosis.[63] At the beginning of 1938, prospective committee chairmen, Hercus (Thyroid), Malcolm (Nutrition) and Barnett (Hydatid Disease) prepared extensive plans for the work their committees were to do and submitted them to Watt.[64] The plans were not very different in that each researcher wanted to collect statistics on their field of interest, carry out laboratory experiments, some using animals, and to pass on their findings to the public to help prevent disease. For this purpose, the researchers were to use all available means of communicating such as daily newspapers, School Journals, publications by government departments, posters, giving talks at meetings of different societies and at Agricultural Shows. Hercus certainly took a major part in disseminating the results of the studies. In 1940 he commented: 'It is a matter of opinion whether the function of the Medical Research Council ceases with the promotion of facts and their announcement to the scientific world,'

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[62] Hercus, "Second Hudson Lecture," 107.

[63] The Dental Committee did not become active until the late 1940s.

[64] John Malcolm to M.H. Watt, February 8, 1938; L.E. Barnett, T.R. Ritchie and C.S.M. Hopkirk to M.H. Watt, February (day not known) 1938; C.E. Hercus to M.H. Watt, February 12, 1938, AAFZ W1318 412 Box 35 Ag.62/3/83 [1] alt.no. 1349 (R18732099) Archives New Zealand.

he said, ‘or whether the Government expect it to function in the education of the public in the practical application of new facts to public needs.’[65] The role of the chairmen of the committees was to prepare an annual report – Hercus wrote the Goitre Committee report and over the space of 12 years he also acted on the Nutrition Committee, the Hydatid Disease Committee, the Virus and Immunology Committee and the Island Territories Committee.

Despite the financial constraints imposed because of the Council’s constitution, researchers still managed to undertake a number of useful projects. Hercus was able to use his influence as Dean to make the most of the aid available and to draw in other research projects under the MRC umbrella. The Council approached the medical profession for grants-in-aid to any who had a research project they would like investigated, but drew little response. Even at this early stage, Minister of Health Peter Fraser promised to look into giving the Council the required powers, but it took until 1951 for this to happen with the passage of the MRC Act.[66]

In order for Hercus to set up the Council’s work within the School, he had to find suitable laboratory space in already crowded buildings. Watt asked the Registrar of the University of Otago to supply details of where the work could take place, the personnel required and funding from scholarships and bequests. [67] Hercus answered the Registrar’s request for information:

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[65] C.E. Hercus to The Chairman, New Zealand Medical Research Council, April 9, 1940, ABQU 632 W4415 Box 514 245 alt. no. 55247 (R18772226) Medical Research – General, Archives New Zealand.

[66] Hercus, “Second Hudson Lecture,” 107-8. Hercus presented the Hudson Lecture to the Wellington Branch of the Royal Society of New Zealand the same evening that parliament was debating the Medical Research Bill.

[67] M. Watt to The Registrar, Otago University, May 24, 1938. ARC-0913 94-121 47 (1938).

> I have found it difficult to disentangle facilities which are available for teaching from those specifically for research. It is evident that in all universities worthy of the name the functions of teaching and research are to some extent combined. … As it is, every endeavour is made to encourage the spirit of research in staff and students and the facilities of the School when not required for teaching are fully available for research purposes.… In the Anatomy Department accommodation and equipment is available … [and] more is available in the Physiology Department than in all the other departments in the School put together.[68]

He doubted that the current facilities for housing experimental laboratory animals were sufficient because they were already using space at Seacliff Mental Hospital and at a 'Dog Hospital' adjacent to the school for this purpose. The School had valuable library facilities in the different departments and in the main medical library. Members of the School's staff were very busy but planned to continue their own research when they could and were willing to advise any research workers.

At the close of this letter, Hercus stated that he had recently been to Wellington and conferred with Watt, showing him a copy of a new building planned to house research projects in at least two floors. Carmalt Jones wrote that this 'Research and Preventive Medicine Block' would contain '7,000 square feet; the total cost was to be £55,000.[69] The university bought the site in 1938 but the building was not completed until 1948, being delayed by the war. The School became severely overcrowded as the government exempted many university students from military service who were able to continue their courses, and

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[68] C.E. Hercus to The Registrar, Otago University, June 21, 1938, ARC-0193 94-121 47 (1938).

[69] Carmalt Jones, *Annals*, 245-6.

refugee doctors were admitted for study. 'If the [new] building were not completed by 1945, Hercus foresaw grave difficulties in the teaching of the additional twenty fourth-year students.'[70] He urgently needed further space. Dorothy Page wrote:

> By 1944 there were other signs of new times ahead. The Dean had driven a hard bargain with the Ministers of Education and Health: in return for the increased student numbers the Government agreed to make an immediate start on a third medical building on Great King Street. … it was intended to house Pathology, Bacteriology, Public Health and Medical Jurisprudence and to provide space for research and animals together with some space for clinical departments.[71]

While waiting for this new accommodation, Hercus worked tirelessly to maintain the research work at the School, even while he was on leave for much of 1939. He had received a Carnegie Grant to visit Britain, Sweden and the US. While Hercus was in London in 1939, he met Watt who was visiting on a Rockefeller Grant and with Malcolm who was also there, met Sir Edward Mellanby.[72] Watt wrote about the meeting without Hercus and Malcolm as his colleagues:

> In 1939 I and two of my New Zealand colleagues happened to be in London together and we called on Sir Edward Mellanby the then Secretary of the British Medical

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[70] Morrell, *Otago Centennial History*, 155.

[71] Page, *Anatomy of a Medical School,"* 121.

[72] J.D. Sinclair, *The Medical Research Council of New Zealand: its development and scope*, YCBN 5997 Box 16g (R7731240) Archives New Zealand.

> Council. He was rather inclined to decry the constitution of our Committee and its method of finance. I pointed out that what we had done after all enabled a beginning to be made with medical research and that it was hoped that the Committee would be reconstituted in due course and its finances put on an assured footing.[73]

On this same trip, Hercus helped select Horace (later Sir Horace) Smirk, then Professor of Pharmacology at the Egyptian University in Cairo, for a position at the School. Smirk later 'opened a new era of research in clinical medicine,' into the management of hypertension.[74] As Carmalt Jones related:

> The Chair of Medicine was advertised, and it was the School's great good fortune that Dr Hercus was in England at the time, and was able to discuss the appointment and the candidates with people of standing. Considerable insistence was laid by his advisors on the importance of research, and a good output of results of research, in the standing of a medical school. … [The short list of four included] a New Zealander, trained at Otago .… Dr Frederick Horace Smirk, who was appointed.[75]

How did the situation compare with that in Australian medical research at the time?

Before discussing Hercus's contributions to the different committees of the MRC, it is interesting to compare the way Australian medical research was being funded, outside of the dedicated medical research institutes, with the situation in New Zealand in the late 1930s. A

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[73] Watt, 'The rest of the day," 96.

[74] Hercus, "Second Hudson Lecture," 110.

[75] Carmalt Jones, *Annals*, 250.

similar body to the MRC, the Australian National Health and Medical Research Council (NH&MRC) was also in the process of being established, meeting for the first time in 1937.[76] This discussion will emphasise the importance of Hercus's contributions to establishing medical research within the School, which was small by comparison with the three Australian Schools whose output was severely hampered by a lack of resources.

References to a lack of staff or equipment or waiting for suitable grants punctuate the NH&MRC's list of projects taking place in Australian medical schools in 1937.[77] As late as 1945, Sir Howard Florey, in promoting the establishment of a national school of medical research, claimed that apart from 'physiology in Brisbane[78] and Melbourne and bacteriology in Sydney, research in the universities contributed little.'[79] Most medical research was undertaken by the largely privately funded medical research institutes in Melbourne and Sydney.[80] There was quite a different philosophy about medical research in Australia – it was considered that research was a full-time occupation and it was better carried out in these institutes rather than in the universities where teaching was the major role.[81]

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[76] J.H.L Cumpston, "Inaugural Address," Appendix 1 in Sixty years of the National Health and Research Council 1936-1996 (Canberra, Australian Government Printing Services, 1996): 20-1.

[77] Ibid.

[78] This research was carried out at The Queensland Institute of Medical Research.

[79] Frank Fenner and David Curtis, 'The origins of the John Curtin School of Medical Research,' jcsmr.anu.edu.au/about-us/first-fifty-years 1948-1998.

[80] The Walter and Eliza Hall Institute (Melbourne), Kanematsu Institute (Sydney) the Baker Research Institute (Melbourne) and the Institute of Pathological Research (Sydney).

[81] Peter Graeme Hobbins, "'Outside the institute there is a desert': the tenuous trajectories of medical research in interwar Australia," *Medical History* 54 (2010): 5.

In 1977, Russell noted that: ‘Before the 1930s research in Melbourne University had taken second place to teaching because funds for equipment and facilities for its encouragement had been almost entirely lacking.’[82] This lack of funds was the greatest single factor in hampering the development of the school. The amount allocated for research was only £280 in 1925 and £824 in 1932.[83] ‘Research therefore was, of necessity a wistful but expensive ideal.’[84]

In attracting funding for even his earliest research and then for the MRC projects within the School, Hercus was able to build on an already entrenched culture of research, inherited from its Edinburgh-trained professors. The Australian schools lacked the equivalent research culture and struggled to establish research programmes.[85] Hercus appears to have managed to carry out research very economically, using his network of helpers in various government departments, his senior students and by obtaining government grants. Some funding from benefactors and from the staff itself such as Louis Barnett and Lindo Ferguson made research possible at Otago. In addition, Hercus was not competing with full-time medical research institutes for funding as the Australian Schools were. Hercus reportedly had a very persuasive manner with politicians to gain grants for his projects, which were always relevant to improving the nation’s health and wellbeing.

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[82] K.F. Russell, *The Melbourne Medical School 1862-1962* (Melbourne, Melbourne University Press, 1977), 155.

[83] Hobbins, “Outside the institute,” 5. Hobbins claims that Melbourne had only £2400 invested for medical research and by 1932 this was a mere £824. Russell was quoting figures from an account by Roy Douglas Wright in 1937.

[84] Ibid.

[85] Ibid., 6.

A feature of the medical schools in Australian universities said to have slowed research was that ‘until shortly before World War II the Australian universities had no full-time professors in medicine or surgery –and, as a result, the schools did not undertake any clinical research. Melbourne University, for example got its first chair in surgery in 1953.’[86] This appears not to have been a major factor at Otago, where the first chair in medicine was inaugurated only in 1940 and that in surgery in 1952.[87]

As in New Zealand in the mid-1920s, attempts to set up a medical research council by the medical schools failed in Australia.[88] In 1925, Melbourne’s Dean of the Faculty of Medicine and the Professor of Pathology proposed that a fund of £30,000 be invested in an Australian Medical Research Council.[89] He argued that:

> Medical research in Australia does not pay, as no investigator can live on the meagre emoluments offered; that research requires co-operation, and such co-operation does not exist in Australia ; that many finely equipped laboratories are now lying idle for lack of men and money; that the medical problems are essentially Australian, and require Australian research.[90]

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[86] Life Offices’ Association for Australasia, *The Life Insurance Medical Research Fund of Australia and New Zealand: the first 20 years* (Melbourne: Life Offices’ Association for Australasia, 1971), 37.

[87] Hercus and Bell, *The Three Deans*, 155.

[88] “Medical Research,” *The Evening Post*, April 29, 1925, 9.

[89] *Ibid*.

[90] Ibid.

In both countries, medical research councils had formed by 1938.[91] Amid concerns of the rate of illness in the Australian population, the declining birth rate, poor maternal and infant health, Australia had inaugurated the NH&MRC, which differed considerably from the MRC that Hercus had helped design and implement.[92] Encouraging research was only one of the aims in the NH&MRC's foundation document, the others included schemes for the prevention of diseases such as leprosy, tuberculosis and the prevention of blindness.[93] The Council did not favour university medical schools with grants, the original budget of £30,000 available being to 'approved institutions' for Council-approved projects.

The major difference between the New Zealand and Australian Councils was that the majority of funding in New Zealand went to a single institution, the Otago Medical School, which hosted nearly all the research projects. There was little chance of overlapping of research efforts among different research groups as had happened in Australia. Professor Wood-Jones criticised the Australian schools of duplicating their research efforts, with 'some outstanding Australian problems … hardly touched on, and much honest endeavour …more or less wasted through lack of co-ordination between the various medical schools and research institutes.'[94]

As in the New Zealand model, there were several committees and sub-committees set up by the NH&MRC in the following years to investigate nutrition, tropical physiology,

[91] Anon. "The Australian National Health and Medical Research Council," *The Australian Journal of Science* 3 (1941): 73-75.

[92] Ibid., The first session was held in February 1937 in Hobart.

[93] *Sixty years of the National health and Medical Research Council 1936-1996,* ed. Anon (Canberra: Australian Government, 1996): 6-10

[94] F. Wood-Jones, "The problem of medical research in Australia," in *Sixty years of the National Health and Medical Research Council 1936-1996,* ed. Anon (Canberra: Australian Government, 1996): 100.

obstetric research, industrial health and other topics of public health. The emphasis was on 'enabling existing institutions to extend their functions more widely in the research field.'[95] In an attempt to provide research workers, the Council offered junior and senior fellowships and part-time grants for medical graduates. The New Zealand MRC also offered fellowships but not until 1948 and they were slow to be taken up, only one being awarded by 1950.[96] The aim was to recruit researchers and their short-term nature allowed a researcher to move on if he found he was unsuited to the work.

The New Zealand MRC Committees: The Tuberculosis Committee

Hercus had been involved in studying tuberculosis ever since arriving at the School inheriting Champtaloup's bacterial typing programme, and as already documented in this thesis, was actively seeking to gain funding from the Travis Bequest to further research within the School when the MRC set up the Tuberculosis Committee in Auckland under the chairmanship of Dr T.W.J. Johnson. Hercus does not appear to have sought to position this effort at the School and it remained the only committee to be located outside Dunedin. Nevertheless, Hercus appears to have kept a watchful eye on its progress and considering that the personnel on the committee included the Health Department's Dr Turbott, who had previously sought Hercus's assistance it is very likely that Hercus was kept well informed of progress.[97] Also on the committee was Dr T.R. Ritchie from the Health Department, Dr W. Gilmour from Auckland Hospital, and Dr Chisholm McDowell. Gilmour supervised tubercle typing at Auckland Hospital.

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[95] Cumpston, "Inaugural Address," 16.

[96] Hercus, "The Hudson Lecture," 109.

[97] Turbott, *Tuberculosis in the Maori,* 5.

The focus of the committee was on gathering epidemiological data on the incidence of the different forms of tuberculosis and in particular locating cases of bovine tuberculosis in humans. Hercus was always keen to study the epidemiology of infectious diseases in New Zealand and reported in his *Wilding Memorial Lecture* that he was very concerned that 'an undue percentage [of deaths from tuberculosis] were women in the child-bearing age period.'[98] He predicted that 'a definite saving can be made here', to improve the health of women and increase the country's falling birth rate. How he meant to remedy this situation is not clear, but ridding the country of bovine tuberculosis was a start and a focus of this committee of the MRC.

The official policy to protect public health was to remove 'clinically affected animals from the herd supplemented by biological testing of composite milk samples, and later by mandatory pasteurisation of town milk.'[99] The committee carried out tubercle typing surveys in Auckland through to at least 1950. Data from the much larger population in Auckland is likely to have been very useful to Hercus to add to his results from tubercle testing in Dunedin. In 1939, the committee reported having carried out a survey of the incidence of

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[98] Hercus, *Wilding Memorial Lecture*, 13.

[99] R.M. Davidson, "Control and eradication of animal disease in New Zealand," *New Zealand Veterinary Journal* 50 Supplement (2002): 8. Anon., "Undulant fever," *NZMJ* 32 (1933): 187-96. In the mid-1940s, Hercus gave evidence to the Milk Commission set up to report on the supply of milk to the main metropolitan areas. His laboratory had been testing samples of pasteurised milk over 1941-2 with very poor results. Even earlier, acting as chairman of a meeting of the Pathological and Bacteriological Society in Dunedin, he reported cases of brucellosis in humans possibly caused by unclean milk. The only preventive measures available were to use only the milk of mixed herds in order to dilute the pathogen or pasteurise the milk. It took some years for reliable pasteurisation techniques to evolve.

tuberculosis in New Zealand and having received the results of a health survey of nurses carried out by the nursing division of the Department of Health.[100]

The committee also studied the incidence of tuberculosis in the Maori population in 1940 and in ‘certain occupations’ in 1941. In 1942, the committee reported being restricted in its work by the demands of war but did continue its existing projects. The MRC funded School Medical Officer, Dr Marie Buchler’s study of the incidence of pulmonary tuberculosis among office and factory workers and school children in Wellington.[101] In May 1943 at a conference on public health problems with special reference to war conditions, Hercus suggested adopting standardised methods for culturing tubercle bacilli and recommended laboratories in secondary centres of the country to be under the charge of qualified medical practitioners.[102]

That year, spurred by the fact that tuberculosis was in fourth place as a cause of death, the Department of Health formed a special Tuberculosis Division under Dr C.A. Taylor, with the aim of spreading the necessary propaganda to prevent the disease.[103] With apparently three different research groups working on tuberculosis from 1943, it is difficult to untangle the individual efforts. The committee continued its survey work over 1944 and reported that Travis Bequest Fellow, Dr Edson was investigating culture media in his laboratory in Dunedin, as were his staff members under Dr Gilmour in Auckland.[104] This infers a close affiliation between the two groups.

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[100] Annual Report of the Director-General of Health, *AJHR* 1939, H-31, 9.

[101] Marie Buchler, “Pulmonary tuberculosis in wellington. A radiological investigation among office and factory workers and secondary school children,” *NZMJ* 43 (1944): 73-81.

[102] Anon., “Medical conference on public health problems in New Zealand,” *NZMJ* 42 (1943):164.

[103] Ibid., 170.

[104] Annual Report of the Director-General of Health, *AJHR* 1944, H-31, 10.

In 1947, Gilmour reported 13.3 percent bovine non-pulmonary cases in humans in the years between 1942 and 1947 and only one from 294 pulmonary cases.[105] Data from other parts of New Zealand suggest that only very small number of bovine cases now registered and the chief source of infection was human. Tuberculosis was now the fifth highest cause of death in New Zealand, and the highest cause of death in females 20-30 years (Maori and European), and the highest single cause of death among Maori. Eventually the typing programme shifted to surveying only areas where cases had been reported. Trials of BCG vaccine were carried out among nurses and navy personnel. A move to appoint a medical officer to the committee failed in 1947 – the members decided to leave that up to the Department of Health.[106] In 1948, Dr J.M. Wogan a new part-time Tuberculosis Research Officer investigated the disease in nurses.[107] Thus, until the reformation of the MRC in 1951, the Tuberculosis Committee had researched the incidence of the disease in different groups in society and was looking for the most suitable laboratory techniques to detect the bacilli in different types of specimens. They also recommended how health authorities could implement these tests to find the source of the infection, whether it were bovine or human in origin.[108] The Tuberculosis Division of the Department of Health was represented on the MRC committee and was active in educating the public on the control of the disease.

The Thyroid Research Committee

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[105] Annual Report of the Director-General of Health, *AJHR* 1947, H-31, 35.

[106] Minutes of the Annual General Meeting of the Medical Research Council May 20, 1947. ADBZ 16163 H1 Box 15691 240/1/7 alt. no.23325 (R20960285) Archives New Zealand.

[107] Annual Report of the Director-General of Health, *AJHR* 1948, H-31, 43.

[108] Annual Report of the Director-General of Health, *AJHR* 1949, H-31, 50-51.

Hercus's role in the goitre/thyroid committee was as the 'convenor' or chairman, with Malcolm, Purves and Kennedy as the other committee members.[109] Hercus updated his original plans for research constantly as the team made discoveries and new members with other areas of expertise joined the group. Hercus also encouraged his students to study aspects of the goitre problem for their dissertations, and at times, they were the only source of statistics that Hercus could use, his pleas for government assistance in gathering this data largely having gone unanswered. As chairman he wrote annual reports and published review papers in the *New Zealand Medical Journal* but his team carried out the practical studies. For most of the life of the MRC up until 1951, Hercus campaigned to have the levels of iodine in salt brought up to a satisfactory level and to ensure that people actually used it: he followed closely the reports of how much iodised salt was being imported into the country and estimating if this was sufficient.[110]

In what was to become a major area of research – the investigation into the health of Pacific Islanders, Hercus addressed the Royal Society's 1947 Congress on how he was planning to base a research unit at the School to direct studies into the many diseases prevalent in the Pacific.[111] His emphasis was as always on endemic goitre, nutrition and dental caries, but would also include tropical infectious diseases. As chairman of the Medical Section of the congress he gave the opening address and a second one on endemic goitre in

[109] C.E. Hercus to M.H. Watt, February 12, 1938. AAFZ W1318 412 Box 35 Ag.62/3/83 [1] alt.no. 1349 (R18732099).

[110] Director (unnamed) of Spedding Limited Auckland to Dr C.E. Hercus, April 10, 1945. In *Annual Report of the Medical Research Council of New Zealand 1944-5*. (Wellington: Department of Health, 1945), 7.

[111] C.E. Hercus, "New Zealand's responsibility for medical research in the South-West Pacific," RSNZ Report of the 6th Science Congress 1947, *Transactions & Proceedings of the Royal Society of New Zealand,* 7 (1949): 303-6.

which he reiterated his belief on the causes and his evidence, gathered over the past 25 years.[112] He was unaware of endemic goitre in the Pacific Islands so was no doubt keen to visit himself. Once again, he was relying on his fifth-year students – this time three Fijian graduates who had studied the topic for their dissertations, had found only a few examples in Fiji where the inhabitants did not have access to seafood.[113]

Finding an experimental model for goitre

One of the major aims of Hercus's team was in finding a reliable animal model to study goitre. During the 1930s, the Department of Agriculture investigated several outbreaks of goitre in lambs and Hercus followed up one in particular that occurred at Wanaka in 1930. There he and Purves found that the affected animals had eaten turnips, which are of the same family as cabbage (Cruciferae).[114] American studies had shown that animals eating cabbages developed goitre but this was not the case in New Zealand. Prior to the setting up of the MRC, students and staff had experimented with inducing goitres in rabbits fed on New Zealand cabbage without great success over the period 1932-4.[115]

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[112] Ibid., 311-13.

[113] These were 'Drs Dovi, Satyanand and Sahu Khan.' None of the dissertations by these students are held in the collection at the School but would have been written in 1933, 1937 and 1944, respectively.

[114] Hercus and Purves, "Endemic and experimental goitre," 197; Muriel Bell, *Nutrition in New Zealand: 40 years' history, 1920-60* (Dunedin: New Zealand Association of Home Science Alumnae, 1962); 5. Bell reports 'the ewes had been wintered on swede roots, and when the lambs were born, they were unable to breathe because of atrophy of the trachea through pressure of enormous thyroid glands.'

[115] M.K. Steven and G.W. Moore, "Study on endemic goitre in Stratford and Mid-Canterbury districts" (Unpublished Student diss., University of Otago, 1933).

Hercus and Purves carried out a series of experiments to confirm that eating turnip roots caused goitre in laboratory rabbits. Over a period of two years, they sent animals from the School to the site of the epidemic where they fed on turnips before having them returned to Dunedin. The animals now had enlarged thyroid glands. Hercus and Purves concluded that the active ingredient was probably a glucoside, and as seeds are the richest source of glucosides, they decided to use Brassica seeds, especially rape-seed, in further experimental diets.[116] Hercus and Purves were the first to show goitrogenic activity in the roots of a Brassica species.[117]

As was common with Hercus's policy on involving his students in research, in 1937 he perhaps inspired Lawrence Malcolm to complete his fifth-year dissertation on 'the effect of the goitrogenic factor in turnip seeds on the metabolic rate of rats.'[118] This study, carried out in the Physiology Department, helped focus attention on how the substance caused goitres – it appeared to interfere with the manufacture of thyroxine in the thyroid.

The team made a major advance when Kennedy showed that the active ingredient in the Brassica seeds was a thiourea, a chemical compound that researchers could now use in place of the seeds. As Hercus said, 'the discovery constituted a considerable advance as it provided an unfailing source of active material.'[119] Kennedy communicated this finding via a letter to

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[116] Ibid., 182-203.

[117] Ibid., 198.

[118] C.E. Hercus and H.D. Purves, "Thiourea and its derivatives in the treatment of thyrotoxicosis," *NZMJ* 43 (1944): 213; C.E. Hercus, "The thyroid gland and recent research," *NZMJ* 45 (1946): 327. Hercus and Purves quote from Lawrence Malcolm's student thesis in both papers. It is missing from the collection in the Medical School.

[119] Hercus and Purves, "The use of thiourea and its derivatives," 213.

the prestigious journal *Nature* in 1942.[120] Kennedy's name does not appear on the team's papers until 1945, perhaps because as Hercus reported, he was following up his finding by repeating a number of earlier experiments using his newly identified compound.[121] Although the team regularly published their findings, they missed being the first to discover that thioureas inhibited synthesis of thyroxine in the thyroid gland as Hercus explained: Simultaneously, two groups of American workers … reported investigations into the thyroid hyperplasia produced in rats by sulphonamide and thiourea derivatives … Priority of publication of this discovery therefore rests with these workers.[122]

With the establishment of the Goitre Committee of the MRC, Hercus directed much of the laboratory studies in the Thyroid Research Department toward investigating Brassica seed-induced goitres using albino Wistar rats.[123] In October 1941, the team published the first of a series of at least eight papers in *The British Journal of Experimental Pathology* relating the results of these studies. Up until now, Hercus had mostly published with *The Journal of Hygiene* and this change reflected the changing focus of the goitre studies away from endemic goitre in humans to understanding the fundamental physiology and biochemistry of the thyroid gland. Gone are Hercus and his co-workers' long multifaceted papers: the new ones are brief and targeted to few major points. His name does not appear on any of the eight papers, now written by Kennedy, Purves and Walter Griesbach, in various combinations. He did write review papers on all the projects for the *New Zealand Medical Journal* and regular

[120] Kennedy, "Thio-ureas as goitrogenic substances," 233-4.

[121] Hercus, "The thyroid gland and recent research," 328.

[122] Hercus and Purves, "The use of thiourea and its derivatives," 213.

[123] Hercus and Bell, *The Three Deans,* 186. John Malcolm had first brought albino Wistar rats to the School in 1924.

reports for the Council, while subtly changing the aims of the committee as new discoveries suggested fruitful lines of enquiry. Employing Griesbach, a 'masterly pituitary cytologist' from 1939 had introduced yet more possibilities for research.[124] Specialising in pharmacology and metabolic disorders, he was to become a great asset to the research programme.

Walter Griesbach was a German Jewish refugee doctor brought to New Zealand by Hercus, who had been approached by 'The Society for the Protection of Science and Learning' in England to offer Griesbach employment.[125] Professor Karl Popper from Christchurch's Canterbury College had initially advised the Society that there could be vacancies in New Zealand for displaced scientists. Lord Rutherford, the Secretary of the Society wrote:

> In conjunction with the Society, the Carnegie Foundation most generously offered to pay the salary for two years of any scholar invited by an Empire University, if that university gave a reasonable assurance of the absorption after these two years of the scholar in its normal academic life; the Corporation would further pay the passage of the scholar and his family and the transport of his possessions.[126]

Hercus took until December 1938 to respond to the request, during which time he communicated with Griesbach and approached Griesbach's brother in London to guarantee a

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[124] Anon., "Obituary: Herbert Dudley Purves," *NZMJ* 106 (1993): 297.

[125] [Lord] Rutherford, "A Society for the Protection of Science and Learning," *BMJ* 1(1936): 607. The society aimed to 'give assistance to scholars of any country who, on grounds of religion, race, or opinion are unable to carry on the scientific work for which they are qualified.'

[126] David Cleghorn Thomson to Professor C.E. Hercus, September 2, 1938, ARC-0193 94-121-47 (1938).

further two years' salary for him. Hercus negotiated with the university to accept Griesbach as a Research Fellow, assuring the university that the appointment would not cost it anything at a time of restricted funding and unemployment. He also let the Council know that he was looking for other staff such as a biochemist and a nutritionist. At the end of January 1939, Hercus would be in London on a Carnegie fellowship and offered to meet the secretary. He may have met Griesbach who was about to set sail for New Zealand at this time, his monetary situation resolved.

Griesbach faced prejudice in New Zealand, as did other German refugee doctors at the time, but later wrote that he had appreciated Hercus's support against the attitude of clinical staff at the hospital.[127] Although Griesbach was to work on the thyroid project it took several years before he could work fulltime on research. Staff shortages in the Physiology Department caused by the war meant Griesbach took on some teaching duties. Nevertheless, Griesbach's first paper appeared in a series of experimental goitre studies in 1941 in which he examined the cytological changes in the anterior pituitary of rats fed on a Brassica seed diet.[128]

The thyroid research programme proved, through several animal experiments that the active substance in Brassica seeds caused goitres to form through inhibiting thyroxine production in the thyroid gland. Thyroxine injections prevented these goitres but feeding iodine to the animals did not. The diet also caused changes in the pituitary gland, which Griesbach studied in order to identify which particular cell type produced thyrotropic hormone (now called Thyroxine Stimulating Hormone, TSH), which the team had found to

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[127] Schwartz, "Griesbach," 32.

[128] W.E. Griesbach, "Studies on experimental goitre II: changes in the anterior pituitary of the rat, produced by Brassica seed diet," *British Journal of Experimental Pathology*, 22 (1941): 245-9.

be essential in causing goitre. The seed diet could not produce goitres if the animals had their pituitary glands removed. Eventually Griesbach showed that the basophil cells of the pituitary gland secreted TSH, which when activated the production of thyroxine by the thyroid.[129]

A new research target: thyrotoxicosis

These discoveries were to lead to quite a new line of enquiry to be followed up by Hercus and others as a treatment for thyrotoxicosis or toxic goitre. At the Thyroid Clinic of the Dunedin Hospital, of which Hercus was the Chairman, and on the hospital wards, focus was now on running clinical trials of thiourea on patients with thyrotoxicosis to establish safe and effective dosages. Smirk directed the clinical investigations, which began in 1943, initially with allylthiourea because thiourea was unavailable. Researchers found that allythiourea caused severe reactions and discarded it. Thiourea, although it did work for some patients was an unpleasant drug, as it caused the patients to reek of sulphur and other unpleasant effects. Smirk found he could treat most cases as out-patients using a uniform method. Hercus reported the results as encouraging and they compared well with those obtained elsewhere with thiouracil, but:

> Prevention is the ultimate aim – prevention of an environmental abnormality of the thyroid which may become a mechanical disfiguring nuisance or an over-functioning menace or occasionally the seat of malignant change. … The cause of thyrotoxicosis is still unknown. The exact mechanism by which thyroxine acts is still obscure. The only

[129] Griesbach, "Studies on experimental goitre II," 245-9.

> thing which is certain is that progress will come only with more and better basic scientific research supported with increasing liberality from public funds.[130]

Under Hercus's leadership, the Thyroid Committee of the MRC produced a record chart for clinicians to use when treating patients. Two Auckland researchers, E.J. Fischmann and A. Fischman, followed up the Dunedin work by trialling patients with thiouracil in 1948, modifying the chart to their own experiments.[131] They received advice from Hercus and the others in the Dunedin group. Their conclusions were that it was better to operate on some patients than to treat them with the experimental drugs and that 'the most elegant method to treat toxic goitre' would be radioactive iodine – it was a whole lot less dangerous, but it was not freely available in New Zealand. The cost of transporting it by air in heavy lead containers was prohibitive. At the close of the 1940 era, the Dunedin team began studies on the use of radioactive iodine in the uptake of iodine in the thyroid gland, in thyroid tumours and in treatment.[132]

Hercus was not actively carrying out any of this work, but in addition to the *New Zealand Medical Journal* review papers detailing the advances the thyroid group was making, he wrote reports for the MRC, and as mentioned above, assisted other researchers. The thyroid research programme seems to have permeated several other Departments in the School. This is evident in one of Griesbach's papers where he acknowledged the assistance of Professor

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[130] Hercus, "Thyroid gland and recent research," 330.

[131] E.J. Fischmann and A. Fischman, "Thiouracil versus surgery: a tentative comparison based on 100 treated cases (with a note on radioactive iodine)," *NZMJ* 47 (1948): 537-50.

[132] Hercus, "Second Hudson Lecture," 111.

Gowland (Anatomy) and his assistant in completing his study.[133] Hercus prompted thyroid research in the Department of Physiology in 1944 when Lawrence Malcolm and V.I.E. Whitehead examined muscle fatigue in albino rats and related it to the thyroid gland.[134] Griesbach helped the pair remove the thyroids from the rats. This experiment was research outside of the MRC but its publication would help build up the School's reputation for carrying out medical research.

The influence of the thyroid work on cancer research

Publication of the thyroid work in overseas journals led in a circuitous way to Hercus's employment of two highly skilled biochemists, Dr Franz Bielschowsky and his wife Dr Marianne Bielschowsky at the School.[135] Bielschowsky had been evicted from Hitler's Germany in the 1930s.[136] After some years in Spain, he found work in the Department of Pathology and Cancer Research Laboratories at the University of Sheffield where he began to study experimental cancer in rats using the insecticide 2-acetyl amino-fluorene (AAF) from

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[133] Griesbach, "Goitre studies II," 249.

[134] J.L. Malcolm and V.I.E. Whitehead, "Muscular fatigue in the albino rat, and its relationship to the thyroid," *British Journal of Experimental Pathology* 25 (1944): 160-3.

[135] Gordon Parry, *Clipping the claws: the first sixty years of the Otago and Southland Division of the Cancer Society*, (Dunedin: The Division, 1989), 25. Marianne worked in 'an honorary capacity almost from the time she and her husband arrived, [and eventually was put] on the payroll.'

[136] C.M. Goodall, "Dr Franz Bielschowsky: 1902-1965: An appreciation," *Cancer Research* 26 (1966): 347-8; Georgiana M. Bonser and R.A. Willis, "Franz Davis Bielschowsky: 5 January 1902–21 April 1965," *Journal of Pathology and Bacteriology* 93 (1967): 357-64.

1942.[137] The compound, derived from coal tar, had been found to be carcinogenic as early as 1914 and it was readily available. He found that it produced a great variety of tumours in experimental animals but none in the endocrine glands.

Reading about the Dunedin team's work on experimental goitre gave Bielschowsky the means to investigate this conundrum. Using the Brassica-seed compound in conjunction with AAF he produced benign and malignant tumours in the rat thyroids but neither compound did this alone.[138] From this finding, he could study the cell changes and speculate on the hormonal control of the cell growth by the pituitary gland. The work had implications for human health, as it was important to understand how thyroid cancer developed. Researchers knew that 'cancer of the thyroid nearly always originates in a goitrous gland.'[139] Bielschowsky's 1944 papers seem to have inspired the Dunedin team to study the production of thyroid adenomata (benign tumours) in rats on their Brassica seed diet. They diverted from a planned experiment that aimed to study the effects of alternating the goitre-inducing diet with a normal one when they found the rats had developed adenomata in their thyroids.[140] They attributed this to the long-term feeding of the Brassica seeds and not to any tumour-forming agent in the seeds. The adenomata had formed through exposure to 'excessive amounts of thyrotropic hormone.'[141] Bielschowsky referenced this paper in the report of his

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[137] F. Bielschowsky and H.N. Green, "2-aminofluorene as growth inhibitor for bacteria and rats," *Nature* 149 (1942): 149.

[138] F. Bielschowsky, "Tumours of the thyroid produced by 2-acetyl-amino-fluorene and allyl-thiourea," *British Journal of Experimental Pathology* 25(1944): 90-5.

[139] Ibid., 90.

[140] W.E. Griesbach, T.H. Kennedy and H.D. Purves, "Studies on experimental goitre. VI. Thyroid adenomata in rats on Brassica seed diet," *British Journal of Experimental Pathology* 26 (1945): 18-23.

[141] Ibid., 23.

next experiment, which was to produce nodular tumours in rats using the same compounds as before.

Bielschowsky and the Dunedin group appear to have been competing, each taking the research a step further as they made and confirmed discoveries. Co-operative research must have been very difficult if not impossible in the 1940s due to the length of time it took to correspond and send articles for publication and to receive the journals in return. As Dr Barbara Heslop who was working in transplantation research in the School noted that during the 1940s when much of this work was being done, 'the war clouded everything and there was not much money', and there was unlikely to have been any pressure to publish, she believes.[142]

> [In 1953] such journals as the Medical School took arrived by surface mail several months after publication. There were no photocopiers, so one was lucky ever to see a pre-print. Long distance telephone calls were expensive and apt to come with disconcerting "noises off", so ringing one's Northern Hemisphere colleagues for a chat was simply not on.[143]

Purves and Griesbach followed their 1945 paper with another investigating thyroid cancer in rats treated with thiourea, the active compound in the Brassica seeds. They concluded that the cancers were produced by 'the excessive and prolonged stimulation of the thyroid

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[142] B.F. Heslop, "Surgery: transplantation research in Dunedin," in *Medical Research in Otago 1922-1997, As portrayed by 75 years of the Proceedings of the University of Otago Medical School*, ed. Edwin Nye (Dunedin: Otago Medical Research Society, 1998): 153.

[143] Interview with Dr Barbara Heslop, May 5, 2013.

epithelium by the thyrotropic secretion of the pituitary', an action 'analogous to the production of breast tumours in susceptible animals by administration of excessive amounts of oestrogen.'[144] Their final paper in the series appeared in 1947 and expanded on the previous work producing cancers with thiourea. In his final years at Sheffield, Bielschowsky moved on to produce tumours in rats through painting another coal-tar derivative on their skin.

There does not appear to be any surviving record of correspondence between Bielschowsky and Hercus at this time but Hercus would have been well aware of the experiments: the Otago team and Bielschowsky published their work in *The British Journal of Experimental Pathology*. Bielschowsky's series of papers on experimental cancer appeared in the journal between 1944 and 1946 while he was at Sheffield. There are no more papers in this journal until February 1949, by which time he had arrived in Dunedin and begun working with Malcolm, Griesbach and Hall.[145] He was now Research Fellow in the Cancer Research Laboratory of the NZBECCS in the School, having replaced Andrew Begg who had resigned in 1948.

The Yorkshire Branch of the BECCS had at least partly funded Bielschowsky's work in Sheffield so a change of location within the same organisation may have been a natural choice, but it is hard to imagine that Hercus did not have a hand in the appointment. He needed a replacement for Begg to maintain cancer research within the School and he needed

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[144] H.D. Purves and W.E. Griesbach, "Studies on experimental goitre. VII. Thyroid carcinomata in rats treated with thiourea," *British Journal of Experimental Pathology* 27 (1946): 294-97.

[145] W.H. Hall, "The role of initiating and promoting factors in the pathogenesis of tumours of the thyroid," *British Journal of Cancer Research* 2 (1948): 273-80. Hall, technician in the Cancer Research Department thanked Bielschowsky for help in writing this paper which was received for publication in July 1948, indicating that Bielschowsky was in Dunedin before that date or he had been in communication with him.

a biochemist. In addition, Bielschowsky was working in a closely related area of research to Hercus's own team.

When Hercus visited Britain in 1946 to attend the Royal Society's Empire Scientific Conference, he visited several research centres within Britain mostly in Oxford, Cambridge and London.[146] It may be that he included the University of Sheffield in his travels and met Bielschowsky, with whose work he was already familiar. Several other researchers in experimental cancer research used the early work done by Griesbach, Kennedy and Purves and it was highlighted in one of the papers of the inaugural issues of the *British Journal of Cancer Research* published in March 1947.[147]

Up until the MRC was reformed in 1951, Bielschowsky continued to study experimentally induced cancers, not only of the thyroid. There was a crossover with the Thyroid Research Department of the MRC at the School resulting in joint papers to the *British Journal of Cancer Research.* Kennedy synthesised the AAF needed for Hall to carry out his experiments in 1948, while Hall looked after the animals. The funding from the BECCS that Bielschowsky received must have extended the work that the Thyroid group of the MRC could achieve on its limited budget. The Thyroid Committee's work expanded as the 1950s approached and its name changed to the Committee for Endocrinology Research. In summing up the MRC research into the thyroid, in 1950, Hercus wrote 'This research illustrates admirably the value of co-operation between many scientific disciplines. The Departments of

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[146] Rigg, Hercus and Marsden, "The Empire Science Conference," 7-12, 17-19. The 'conference' was actually two separate meetings, the first being The Royal Society Conference held in June, with delegates staying one week each in Cambridge, Oxford and London, with visits to research institutes and similar businesses planned for each afternoon. Hercus addressed the Medical Section on goitre research.

[147] A.H.M. Kirby, "The combined action of 2-acetylaminofluorene and sex hormones in the Wistar rat," *British Journal of Cancer Research* 1 (1947): 68.

Geology, Chemistry, Physics, Surgery, Anatomy, Physiology, Pathology, Medicine and Preventive Medicine have all made significant contributions to the study.[148] While all this work by Hercus would seem to be enough for one person to co-ordinate, he also performed roles in other committees of the MRC which I will introduce in the following chapter.

Conclusion

Attracting private funding to the School for research was not without controversy for Hercus and garnering a large part of the Travis Fund was achieved in a rather unfortunate manner. He was able to persuade the trustees to provide funding for tuberculosis research that led to the establishment of the Tuberculosis Research Department within the School in 1940 and the eventually fruitful research into biochemistry of the tubercle bacillus.

Hercus proved his students' research was again useful to him – this time in the heredity of different cancers in a series of dissertations over a period of years. Cancer research was to flourish with Bielschowsky's appointment aided by funding from the BECCS after Begg's reportedly unhappy time in the role. The School benefited through the added source of funding and the fact that Hall stayed and added his expertise in animal husbandry to the research.

Attracting the work of the MRC to the School was a great coup for Hercus and his co-workers. Focusing first on health issues relating to living in the New Zealand environment, such as goitre caused by insufficient iodine in the soil, dental caries from a lack of fluorine, hydatid disease from poor animal hygiene in the rural community and nutritional problems exacerbated by wartime restrictions, the work of the committees expanded into wider, more complex areas. His biggest contribution at this time perhaps was to provide research space in

[148] Hercus, "Second Hudson Lecture," 111.

the Hercus Building when there were severe restrictions on erecting university buildings immediately post-war.

Hercus gained overseas insight into research methods, visiting medical research facilities in Britain and the US while observing physical fitness programmes that were to encourage his advancing the establishment of the Physical Education in the coming years. He continued to employ suitable staff and showed openness and compassion in bringing the German Jewish refugee researchers to Otago at a time when there was much prejudice against this kind of action.

Chapter Seven: The Medical Research Council expands and matures

> *Altogether the Otago Medical School in its comparatively short history, has made quite a contribution to human welfare*.—C.E. Hercus, 1954[1]

> *One has heard rumours that politicians in Wellington used to be scared of Sir Charles, a very happy state of affairs*.—Duncan Adams, 1969[2]

Introduction

The first half of the 1940s in New Zealand 'felt like living through a protracted catastophe', while with victory in 1945, 'a radiant confidence returned to the country.'[3] Much of the research undertaken by the MRC in the 1940s was constrained by wartime restrictions on staff numbers, financial limitations and shortages of materials and equipment. The war did however, suggest new areas of medical research aimed at finding local substitutes for imported food items and in the process analysing their food values. Changing dietary patterns exposed New Zealanders' teeth to increased risk of caries, for which the dental committee recommended the unpopular idea of fluoridation of drinking water supplies.

The period covered by the MRC in its initial organisation, which lasted until 1951, also saw increasingly complex areas of research undertaken at the School. These included neurophysiology and neuropathy by Malcolm's successor in Physiology, and hypertension studies in Clinical Medicine under Horace Smirk. A major factor in the success of these research committees was the new accommodation that Hercus fought for and achieved in 1948 with the completion of what was to become the Hercus Building. This purpose-built

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[1] Hercus, "The coming of age of Digest," 8.

[2] Adams, "Medical School 'Hercus Building' home of world famous research."

[3] Paul Moon, *New Zealand in the twentieth century* (Auckland: HarperCollins, 2011), 312.

accommodation for research was world-class with a special focus on housing experimental animals.

With the approach of the 1950s came a period of prosperity for the country, and 'for the next 30-odd years … more New Zealanders enjoyed a better life than they could have had in previous years, and their world … survived for the active adult lives of those who built it.'[4] There was a sharp rise in child bearing by increasingly younger women and older women who had delayed having families during the war years, as the economy recovered. The country experienced a second agrarian revolution as 'giant discing and aerial top-dresing' increased production of beef, lamb, butter and wool for sale at high prices on world markets.[5] Air travel became more reliable and affordable allowing researchers such as Hercus to commute regularly to Australia and further afield to promote their work and in his case, to arrange valuable funding for research.

A doubling of committees

The MRC grew from an initial six committees to twelve, not all of which were continually active. The Dental Research Committee did not report from 1941 to 1945 and there is only one mention of a Psychiatric Research Committee (in 1947). By 1950, when negotiations began to set the Council on a better footing began, there appears to be at least ten functioning research groups. The research became more specialised and laboratory-based, moving away from the epidemiological studies that had characterised a large part of the earlier research.

As the focus of public health changed in the time around the Second World War, so did the emphases of the student theses, many of which added valuable information to the work of

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[4] Wright, *Illustrated history of New Zealand*, 363.

[5] Ibid., 366.

the committees of the MRC. Between 1938 and 1950, the most commonly studied subjects by students relevant to the work of the MRC were tuberculosis and hydatid disease. Also reflected in the dissertations is an increasing interest in industrial health. Many of the students carried out studies no doubt influenced by the work they carried out in their long vacations, resulting in studies on preventive health in freezing works, shearers' quarters, the waterfront industry and woolstores.[6] An increasing number of students chose to investigate problems in nutrition, mainly between 1946 and 1948, at the same time as several others examined children in Health Camps where improving nutrition was an important component.

Nutrition Committee

Hercus wrote few papers on nutrition apart from his goitre studies but maintained an interest in this ever-changing field. In 1933, Hercus reported on the latest international research into nutrition at a meeting of the Clinical Club and a rare comment on his medical observations in Amman during the First World War.[7] He was a member of the Nutrition Committee since its

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[6] C.E. Hercus, "Minutes of the 124th meeting of the Clinical Club, July 13, 1934," in *The Minute Book of the 1928-1939 period of The Clinical Club of Dunedin*, 85. 'Dr Hercus gave an account of recent developments in the field of Industrial Hygiene. … The scope of the subject as it applied to vocational guidance, selection of workers, prevention of fatigue and accidents, hours of work, the effects of noise and vibration etc. was illustrated by reference to various reports of the Industrial Health research board and to various student studies carried out in various parts of New Zealand.'

[7] Hercus and Bell, *The Three Deans*, 361; C.E. Hercus, "Minutes of the 115th Meeting of the Clinical Club, July 21, 1933" in *The Minute Book of the 1928-1939 period of The Clinical Club of Dunedin,* 66. Hercus 'spoke of the relation of nutritional factors to normal immunity referring to the high incidence of bacillary dysentery and enteric among the half-starved Turkish prisoners-of-war in Amman in 1918,' and discussed how various vitamin deficiencies in pigeons and guinea-pigs increased susceptibility to pneumonia; C.E. Hercus, "Minutes of the 124th Meeting of the Clinical Club, July 13, 1934," in *The Minute Book of the 1928-*

formation. Also on the committee was Dr Muriel Bell, acknowledged as 'Physiologist, researcher, nutritionist, sometime Lecturer in the Department of Physiology; Professor Malcolm's right-hand man', by Hercus and Bell. [8] Malcolm chaired the Nutrition Committee, which also included Michael Watt, and Sir Theodore Rigg.[9] There was also close co-operation between the Home Science School and the School in several nutrition projects and Home Science's Professor Elizabeth Gregory served on the Nutrition Committee.

Home Science studies showed that since the First World War, when 'large-scale evidence of certain food deficiencies in the blockaded areas' there had been a slow change in dietary habits, and not always for the better: dietetic errors were common in New Zealand.[10] The Committee surveyed the foods eaten by householders – by basic wage earners and by Maori families. Researchers also analysed the vitamin and nutrient values of New Zealand foods and investigated infant feeding.

During the Second World War, much of the work of the nutrition committee focused on finding alternatives to imported food products in restricted supply. Reporting on an open day

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1939 period of The Clinical Club of Dunedin, 85. At this meeting, the Club discussed Malcolm's work in remedying 'the dietetic troubles of the Byrd Expedition in relation to their pemmican producing constipation. It contained too much sugar and not enough ballast. Dr Malcolm had recommended seal liver and blubber and liquid paraffin.'

[8] Hercus and Bell, *The Three Deans*, 163.

[9] Gregory was Head of the Home Science School in Dunedin. Malcolm welcomed her presence on the committee especially for her ability to give publicity to the work of the committee through educational outreach programmes at the School.

[10] Elizabeth Gregory and Elizabeth Wilson, *Good nutrition: principles and menus* (Wellington, Department of Health, 1943): 5; "The Chair of Domestic Science," *The Otago Daily Times*, January 30, 1911, 7. The Home Science School was founded in 1911, offering courses that included chemistry, physics, biology, physiology, hygiene and economics, as well as literary and art appreciation.

at the School in 1958, Muriel Bell explained how research had overcome the shortage of oranges through the production of rosehip syrup, which had 'four times the vitamin vale of orange juice.'[11]

> After the Pearl Harbour incident, oranges suddenly disappeared from the shops, and it was then that I was glad that I had seen some of the riverbeds in Central Otago with their numerous briar bushes – noxious weeds, but I had read how the Russians had found that the fruit of the wild rose is extremely rich in vitamin C; and I also had heard that Hitler had caused them to be planted all along the highways in Germany. … [After experimentation] recipes were published in the papers, nurses told the mothers what to do, visits were made to schools – we thought that it would be a quick way to tell the mothers through the children.[12]

The research resulted in the development of powdered rose-hip syrup suitable for incorporating into jam for Prisoner-of-War parcels. Muriel Bell regretted that '[The rosehip] powder was not so easily dealt with in preparing it for the use of infants … but there was no other means of getting the firm to make it [illustrating] the difficulty when lack of machinery operates against the adjustment of wartime requirements.'[13] The committee had rosehip syrup manufactured commercially in Dunedin by W. Gregg and Co Ltd., which was also making

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[11] Muriel Bell, "Seeing is believing … and in Dunedin people may see for themselves," *Health* 10 (1958): 10 and 13.

[12] Ibid.

[13] Muriel Bell, "Report of Nutritionist for the year 1944-45: Nutrition Committee Report", 62. AAFZ W5704 412 Box 32 alt. no. 1349 (R22656157) Archives New Zealand.

‘seameal’ products but had to restrict their production for a time to ensure rose-hip syrup production continued.[14] Seameal Powder, Tablets, Capsules and Dessert Custard, made from locally-sourced seaweeds, were a result of research led by Hercus for ‘a sea-food to supplement the iodine content in goitre districts.’[15] These reached the market in 1936 after Hercus and the company overcame some regulatory hurdles. The Department of Health later recommended these products for patients on a salt-free diet and for expectant mothers.[16]

Research within the Nutrition Research Department helped overcome the shortage of cod liver oil and halibut oil during the Second World War ‘when communications with Norway were cut off’ and Britain stopped exporting it to New Zealand.[17] ‘This department helped prevent a fish-liver oil famine, and indeed that is why so few people knew of the shortage’ commented Muriel Bell.[18] Collaboration with Dr Marion Cunningham at Wallaceville and with the Fats Research Laboratory in Wellington identified local fish with high vitamin levels in their livers. The Nutrition Research Department ‘helped shepherd the New Zealand production of fish liver oils and gave the manufacturers free advice about marketing and

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[14] Ibid.

[15] C.E. Hercus to Director General of Health October 27, 1934. ADBZ 16163 H1 Box 1424 175/71 alt. no. 17200 (R20956907) Archives New Zealand. Hercus was defending the product that he had spent many years developing with the technical help of W. Gregg and Co. from falling under the Goitre Remedy Regulations. Ironically, this letter is in the above file labelled “Quackery File” within the Medical Advertisement file in the Archives. His proposed exemption did not appear in the final wording of the regulations but the product went onto the market as ‘not a drug but a scientific and necessary food’ (1939), or as ‘the cheap way of eliminating troubles due to Iodine Deficiency’ (1938). ‘Seameal’ was an iodine-rich product derived from seaweeds collected from the Otago coast.

[16] Anon., *Health*, 1 (1949) 7.

[17] Muriel Bell, “Seeing is believing,” 10.

[18] Ibid.

dosage.' The manufacturer was the Karitane Products Society in a factory in Wellington's Island Bay.[19]

Another main field of research was into the Vitamin B_1 content of flour, work which in 1950, Hercus stated: '… has ensured that New Zealand white bread has now double the Vitamin B_1 content it had prior to 1946.'[20] Home Science graduate Elizabeth Wilson investigated levels of the vitamin in different wheat mixtures prepared by the Wheat Research Institute of the DSIR over 1939-40.[21] The Institute had recently discovered how to treat wheat germ in such a way that it could be included in bread without affecting the quality of the loaf. This increased the vitamin content in the 'germ bread' used by Wilson in experiments to compare the efficacy of different wheat types on the growth of rats. Wilson also investigated the use of baking powder on the vitamin content in bread making.[22] During the war, supplies of yeast were in short supply, so using baking powder was an option – but it reduced the Vitamin B_1 content by 30 percent, she found. She again proved this by experimentation with rat feeding trials.

One of the major impacts of this research, and that of the many dietary surveys undertaken by the Nutrition Research Committee, was the publication of a booklet called *Good Nutrition*,

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[19] J.M. Mattingley, "Fish-liver oils: a wartime success story" in *New Zealand is different: chemical milestones in New Zealand history*, ed. Denis Hogan and Bryce Williamson (Christchurch: Clerestory Press, 1999): 104-11; Muriel Bell, "Report of Nutritionist for the year 1944-45: Nutrition Committee Report" AAFZ W5704 412 Box 32 alt. no. 1349 (R22656157) Archives New Zealand.

[20] Hercus, "Medical Sciences," 226.

[21] Elizabeth C.G. Wilson, "The Vitamin B content of wheat-germ and germ bread," *The New Zealand Journal of Science and Technology* 24 (1942):25b-34b.

[22] Elizabeth C.G. Wilson, "The effect of baking powder on the Vitamin B content of wholemeal," *The New Zealand Journal of Science and Technology* 24 (1942):35b-38b.

written by Dr Elizabeth Gregory and Wilson and edited by Muriel Bell.[23] Professor Malcolm contributed a chapter on digestion, while Hercus contributed a well-known image of his of a Maori woman with a very large goitre, and advice on how to avoid thyroid problems through dietary means. The booklet was a huge success, the first edition selling out in six months with further editions in 1942 and 1943. In his ‘foreword’, A.H. Nordmeyer, Minister of Health said:

> There is a growing volume of scientific evidence as to the importance of the problems of nutrition. It is hoped that the efforts of the Nutrition Committee of the Medical Research Council will through this practical and reliable guide result in a more general application of present knowledge on this subject.[24]

The Nutrition Committee provided expert dietary advice to doctors including assisting Hand Newton at Christchurch Hospital who prepared a handbook for other hospitals to use.[25] Researchers working for the Nutrition Committee aided some of the thyroid research in 1942 through performing animal feeding experiments using suspected goitrogenic agents.[26] Muriel Bell in her address to the Empire Science Conference in Britain in 1946 highlighted the work

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[23] Elizabeth Gregory and Elizabeth Wilson, *Good nutrition: principles and menus* (Wellington: Department of Health, 1943); Annual Report of the Director-General of Health, *AJHR* 1940, H-31, 9. The booklet was prepared under the auspices of the Otago Medical School, the Medical research Council and the Health Department. ‘This booklet will form the basis of the Department’s teaching on the subject of diet and should be of distinct value towards the better education of the people in the matter of a healthy diet.’

[24] Ibid, 4.

[25] Ibid.

[26] Annual Report of the Director-General of Health, *AJHR* 1942, H-31, 6.

of the Committee and of nutrition research generally in New Zealand.[27] She provided an impressive list of New Zealand publications on nutrition from the 1920s, as well as one of the longest abstracts of the conference. She explained that the research had focused on the food values of New Zealand fish and dairy products, vitamin and mineral content of foods, infant feeding and undertaking dietary surveys. She claimed that the committee's work had suffered initially through a lack of suitable staff and limited accommodation in the School. Researchers worked in in a large room along with the thyroid work in the Lindo Ferguson Building of the School between 1940 and 1948. With the opening of the South Block (later named the Hercus Building), the nutrition researchers moved onto the third floor, alongside the thyroid and microbiology research.[28]

Even before erection of the new building, researchers working on different projects interacted and shared equipment, as noted in the MRC's Annual Report for 1941:

> Apparatus purchased by the Medical Research Council is in use for research purposes, being used by candidates for their Masters degrees. This is an advantage to both University and Nutrition Research Committee in that the apparatus allows students to

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[27] Muriel E. Bell, "The present state of the science of nutrition with particular reference to the special problems of the Empire, including the nutritional status of the indigenous peoples of the colonies," in *Report of the Royal Society Empire Scientific Conference June-July 1946* (London: Royal Society, 1948): 544. Bell is not listed as an official delegate to the conference, New Zealand's representatives being Hercus, Rigg (Cawthron Institute), and Eric Marsden (DSIR).

[28] C.E. Hercus, "Address," in *University of Otago Medical School, New South Block Opening, 1948* (Dunedin, Coulls Somerville Wilkie, 1948), 17.

take up advanced types of study and gives the Nutrition Committee the benefit of their experience with it.[29]

Some projects benefitted through studying different aspects of a common topic, such as researchers on the Nutrition Committee contributing an investigation into ‘the nutritional aspects of dental caries particularly as it concerns the fluorine content of both European and Maori teeth’, to the research into dental health.[30] Graduates of the Home Science School also contributed to dental research. The Dental School, established in 1907, developed a high profile and strong culture of research, partly because of its location in Dunedin, ‘where the Medical School had been established some thirty years earlier and where an appreciation of the value of higher education, often characteristic of smaller communities, had already taken root.’[31] Akers credited the research effort into dental caries as a combined effort by the MRC Dental Research Committee, the Department of Health, the New Zealand School Dental Service, the New Zealand Dental Association and the Medical and Dental Schools.[32] He claimed that ‘The consequence [of this collaboration] was a contagious culture of multidisciplinary research and institutional liaisons that produced exceptional dental epidemiology.’[33]

A later commentator wrote that ‘There was not often evident the “cross-fertilisation of ideas” which Sir Charles had sought,’ claiming that this was a reason why the succeeding

[29] “Medical Research Council,” *AJHR* 1941, H-31, 41.

[30] Hercus, “Second Hudson Lecture,” 111.

[31] H.F. Akers, “Collaboration, vision and reality: water fluoridation in New Zealand (1952-1968)” *NZDJ* 104 (2008): 128.

[32] Ibid.

[33] Ibid. 127.

decades saw a diminishing community of interest between staff of Council and School'.[34] It would appear that in the 1940s this was not the case: the areas of research often overlapped, as stated above, and the personnel shared resources and accommodation as well as meeting to present their projects.

Dental Research Committee

The Dental Research Committee inaugurated in 1938 appeared to make little progress until 1946. This was the year that John Walsh became Dean of the Dental School and chairman of the committee. Like Hercus, Walsh had both dental and medical training.

> Walsh was a powerful advocate of research. Staff members in the Faculty of Dentistry were encouraged to undertake PhD study, and the School of Dentistry set out to "grow" its own researchers by introducing the highly successful MDS graduate programme. This focus on research was achieved with the support of Walsh's ally, Sir Charles Hercus in the Medical School (also a dental graduate).[35]

The research concentrated on collecting data on dental caries in children attending school dental clinics and correlating all dental research underway within the Dominion. As with Hercus's goitre studies, captive subjects in orphanages and boarding schools came under scrutiny as well. This ambitious project aimed to study diets, seasonal variation in caries incidence, immunity of groups or individuals, as well as the effect of economic factors on the

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[34] Annual Report of the Medical Research Council, 1968, *AJHR* 1968, H-31B, 20.

[35] Anon, "Research Report of the Sir John Walsh Research Institute 2009-2010," dentistry.otago.ac.nz/research/sjcori/pdfs/research report2011.pdf

incidence of caries. Although stating in 1947 that the Committee was not yet in active work, Walsh contributed a paper at the New Zealand Science Congress that year.[36] In this he explained the four primary variables in the aetiology of dental caries, bacteria, medium, products and tooth surface how caries formed and how to reduce susceptibility through the use of the fluoride ion or by sealing tooth defects with silver nitrate. He concluded that 'there was a magnificent opportunity for both the state services and private practitioners to undertake full-scale operation of the known preventive measures outlined in the paper.' Another area of research was into making a dentrifice that would prevent caries, but the project failed as it was not suitable for large-scale development, even though the 'tetracycline dentrifice' did reduce caries by 40 percent.[37]

The MRC gave a grant to Marion Harrison, MHSc candidate, to analyse teeth collected from New Zealand dental practices in 1949 to establish their fluorine content.[38] She found these to be deficient in fluorine as were some sheep teeth and bones and that fluorine levels in potable water supplies were very low. She concluded that these facts supported the theory that a low intake of fluorine was a predisposing factor in the high incidence of dental caries in New Zealand. Harrison later said:

> It was Dr Bell who introduced me to the fascination of trace elements when she suggested fluorine as a topic for my masters (sic) thesis. … Every experiment we carried out reflected the low nutritional status of New Zealanders with respect to

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[36] J.P. Walsh, "Recent advances in the attack on dental caries," *Transactions and Proceedings of the Royal Society of New Zealand* 77 (1948-49): 328-9.

[37] Annual Report of the Medical Research Council, *AJHR* 1965, H-31b, 8.

[38] Marion F. Anderson, "Fluorine content of New Zealand teeth," *NZDJ* 45(1949): 1-27.

fluorine – a hunch that Dr Bell had had ever since she had read a paper of McCollum's in 1925 on the effect of fluorine in hardening teeth of rats.[39]

Bell, who served on the Committee for Dental Research from 1951, championed the fluoridation of drinking water for many years before a trial in Hastings took place in the 1950s. This was to take ten years and be paid for by the Department of Health and involve the municipal authorities, the DSIR and the Dental Research Officer of the MRC.[40] The study used Napier for comparison. After nearly five years of fluoridation at Hastings, there was 'a spectacular reduction in dental caries in young children.'[41] Opponents to the procedure later won in the battle to cease the fluoridation of water supplies.

Opposition to the use of laboratory animals

Within all these programmes, the researchers used laboratory animals, a procedure that was not universally popular with the general public. *Good Nutrition* contains images of rats showing differential growth rates on experimental diets so readers would have been aware of the work researchers were carrying out in the School, and through daily newspapers. Questions about vivisection being carried out at the School date back to 1904 and there was an investigation in 1927 when monkeys were used in poliomyelitis studies.[42] In 1937, Watt

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[39] Marion Frances Robinson, *The Moonstone: more about selenium* (Palmerston North: The Nutrition Society of New Zealand, 1975): 11.

[40] Annual Report of the Medical Research Council, *AJHR* 1953, H-31, 54.

[41] Muriel Bell, *Nutrition in NZ*, 10.

[42] "Otago University," *The Otago Daily Times*, December 3, 1904, 2. "Vivisection," *The Auckland Star*, June 15, 1927, 15.

wrote to Hercus about a proposed bill to forbid the use of dogs for animal experiments.[43] There had been a bid by the SPCA to add a clause in the Dogs Registration Act to prevent such cruelty to dogs.[44] This did not happen – subsequent amendments in 1937 and 1955 make no mention of vivisection.

Matters were more serious in 1944, when *The Otago Daily Times* featured several articles that attempted to appease the public. The editorial writer assured the public that the experiments caused no pain to the animals and that they should consider the benefits that would accrue to human health as the result of these experiments.[45] He reminded them that 'Sir Truby King's magnificent contribution to the science of human feeding was founded in part upon his experimentation on living animals.' The Otago Society for the Prevention of Cruelty to Animals contracted the club's honorary veterinarian Mr C.V. Dayus, to visit the School and report back. He responded:

> I have been kindly offered every facility by the Dean of the Medical Faculty at the Otago University to make myself acquainted with the conditions relating to animal experiments at the Medical School I am satisfied that such work is necessary and that it is carried out in a humane manner.[46]

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[43] "Minutes of the 144th recorded meeting of the Clinical Club, August 13, 1937," and "Minutes of the "148th recorded meeting of the Clinical Club, June 3, 1938," in *The Minute Book of the 1928-1939 period of the Clinical Club of Dunedin*. The matter came up again in 1938, when it was noted: 'Anti-vivisection – very vocal in Auckland.'

[44] "No Vivisection of Dogs," *The Evening Post,* March 18, 1937, 8; "Animal Life," *The Evening Post*, July 9, 1937, 10.

[45] "Experiments on animals," *The Otago Daily Times*, July 6, 1944, 4.

[46] "Animal experiments," *The Otago Daily Times*, July 8, 1944, 6.

The work was no different from that carried out in other research institutions in New Zealand and there was no need to single the School out for criticism, he said. Another editorial congratulated the Faculty on providing 'an authoritative and convincing' reply on the matter and that should settle the matter for open-minded members of the community.[47] The Faculty should also take a lesson, the writer claimed, and not hold itself aloof from the people. 'Dunedin is the centre of research in New Zealand in the sphere of medical science; but what knowledge has the average Dunedin citizen of the nature of the valuable work that is being conducted at no further distance from his door than King Street?' the writer continued, and advised the School to 'open its heart more often to the public. …Those who are engaged in research might themselves find stimulation in a public appreciation of the nature of their work and its problems.' Such a policy might well increase public endowment of the research.

Without specifying the period that he was writing about, Fastier commented that 'Professor Smirk played a major role in countering the attacks [of antivivisectionists, and] the most effective defence turned out to be inviting members of responsible public bodies to come along to the medical school at any time and without warning to see what was going on.'[48] The policy appeared to work with 'no complaints being aired for more than a decade.'

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47 "Public enlightenment," *The Otago Daily Times*, July 10, 1944, 2.

48 Fastier, "Sir Horace Smirk," 258. The date he was writing about was likely to have been after 1950 when the British Union for the Abolition of Vivisection was active in New Zealand; A.W.S. Thompson, "Public opinion and public health," *Health* 2 (1950): 2. Thompson, Medical Officer of Health for Auckland reported that 'the British Union for the Abolition of Vivisection send a little yellow leaflet through the post to the parents of new-born babies advising them against having their children immunised' because diphtheria immunisation was 'based on experiments on animals' ; A.W.S. Thompson, "The aim and nature of health

Smirk's decision to use rats as far as possible for his experiments had helped, Fastier concluded.

Hercus and the School had been forward thinking in providing facilities and animals for research. The lack of suitable accommodation and staff to care for experimental animals restricted similar schools from carrying out research in Australia. In Melbourne in the 1930s there was no provision for easy-to-clean small animal houses or the technical help to maintain the animals, wrote Roy Douglas Wright.[49] Researchers had therefore to attend to their own animals and if there were none available, the researchers would have to use material from the post-mortem room because animal experiments were so hard to do.

The bringing of the MRC to the School had increased the problems of acquiring, housing and caring for a large number of laboratory animals ranging from rats and mice to guinea-pigs, monkeys, cats and dogs, and even larger animals at times. Initially the animals had been kept in accommodation on the roof of the Bacteriology building on Great King Street where, by 1941 Hercus reported there were housed some 3,000 animals during the year.[50]

Hercus later regarded it as one of his major achievements to have overseen the building of new accommodation to house not only the MRC research groups but also the animals in the new building in 1948, which was later to bear his name. A representative of the Rockefeller Foundation, visiting in accordance with one of the aims of that Foundation – 'to watch progress in medicine in other countries' – praised the animal quarters in the then almost

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education," *Health* 4 (1952): 4-5. Thompson repeated his warnings about the same group 'trying to frighten parents into refusing to have their children immunised.'

[49] K.F. Russell, *Melbourne Medical School 1862-1962* (Melbourne: Melbourne University Press, 1977), 157.

[50] Hercus and Bell, *The Three Deans*, 186-89.

complete building as being ‘the envy of almost any school I know.’[51] The rest of the building also impressed him as being capable of accommodating three times the staff available, if they were ‘willing to crowd themselves as much as is common in similar buildings in the States.’

Begg’s assistant W. Hall was experienced in small animal husbandry and he managed the animals with the assistance of part-time attendants for many years. One of the big successes of research in the School was in the breeding of animals for research, especially the NZB(BL) lines of mice created by Marianne Bielschowsky over 20 generations to produce animals suitable for experiments into immunology, which led to the study of autoimmune diseases within the School.[52] These mice achieved international fame in the 1950s. The animal breeding programmes at the School were world-class and resulted in animals being sent to international research establishments. The Bielschowsky-bred mice provided Australian immunologist, Sir Macfarlane Burnet with an important experimental aid in 1955.[53] Hercus and Burnet had met in Sydney, and he alerted Burnet to the existence of these animals and so providing him with ‘a heaven-sent opportunity’ to carry out his ‘last experimental topic for personal study.’[54] Hercus’s foresight in encouraging and facilitating the breeding and expert care of laboratory animals is exemplified by this example.

Obstetrical Committee

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[51] “Isolation problem,” *The Otago Daily Times*, May 1, 1948, 8; “Dr Morison’s Review,” Public Health Reprints and Reports, Box 3, Folder 22, Sir Charles Hercus Collection, Medical Library, University of Otago, Dunedin.

[52] Interview with Dr Duncan Adams, February 25, 2012.

[53] Macfarlane Burnet, *Changing patterns: an atypical autobiography* (Melbourne: William Heineman, 1968): 227.

[54] Ibid.

Some of the committees of the MRC initially were not very active due in part to wartime shortages of staff but did establish some preliminary research and gathered data for later study. One such committee was the Obstetrical Committee, established in 1938 under Chairman, Professor Bernard Dawson the first whole-time Professor of Obstetrics and Gynaecology at the School chose to study the toxaemias of pregnancy.[55] Dawson published many articles in the *New Zealand Medical Journal* and reprinted some of them later in *The Proceedings*, which he edited from 1941-50. Dr F.O. Bennett, employed as Obstetrical Research Officer in 1939, examined charts drawn up by 47 hospitals and Plunket ante-natal clinics and presented his first analysis in 1940 and continued until 1942. The following year, Bennett left to serve in the Army and the work 'was carried on in a modified form under difficulty.'[56]

By 1947, the committee had begun research into radiological pelvimetry.[57] Peter Allen, radiologist at the New Plymouth Public Hospital published several papers in *The British Journal of Radiology* in the late 1940s reporting his study on living patients as well as on skeletal material dating from before 1911, part of Professor John Scott's collection held at the School. The Obstetrics Committee appears to have given some funding for Allen's work.[58]

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[55] Hercus and Bell, *The Three Deans*, 332. Between 1932 and 1951, the Department collected statistics on 12,000 deliveries that were analysed by the Obstetrical Research Committee of the MRC.

[56] Annual Report of the Medical Research Council, *AJHR* 1943, H-31, 8.

[57] E. Peter Allen, "Standardised radiological pelvimetry 1. Quantitative aspects," *British Journal of Radiology* 20 (1947): 45. 'Radiological pelvimetry may be defined as the measurement of the female true pelvis by radiological means.'

[58] Understanding of the status of this research is further complicated by the refusal of the MRC to give him assistance to reprint some of his papers in 1948. Minutes of Medical Research Council May 20, 1948, AAFZ 412 W1318 Box 35 alt.no 1349 (R18732099) Medical Research Council, Archives New Zealand.

Several of Hercus's students studied antenatal problems for their dissertations, perhaps inspired to do this when the Health Department published a booklet on maternity exercises adapted from British sources in 1940.[59] Dawson published a paper in 1941 for the Obstetrical and Gynaecological Section of *The New Zealand Medical Journal* presenting the results of a study into the use of these exercises carried out at the Dunedin Hospital over a period of twelve months.[60] It is unclear who carried out the study, but a pair of students studied antenatal and postnatal exercises in 1940.[61] William Gatman and Victor Land looked to see whether the standardised series of exercises had their claimed anatomical and physiological basis. In doing so they not only observed exercised and unexercised patients, they also made a film of the exercises for use by massage students, nurses and midwives. Brookes reports that the Department of Health began allocating money for the making of film for educational purposes in 1941 – it would appear that these students' work reflected the current interest in using film this way.[62] It is tempting to think that they contributed the data for Dawson's paper, but if they did, he did not acknowledge it. Dawson concluded that 'There is no doubt whatever that these [exercises] are of the greatest value.'

The topic faded from the list of dissertations in the following years. An anonymous paper appeared in *The New Zealand Medical Journal* in 1948 reporting a repeat of the 1941

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[59] J.B. Dawson, "Prophylactic physiotherapy in obstetrics," Obstetrical and Gynaecological Section, *NZMJ* 40 (1941): 7-10.

[60] Ibid.

[61] M.W.A. Gatman and V.S. Land, "Ante-natal and post-natal exercises: a study" (Unpublished Student diss., University of Otago, 1940).

[62] Brookes, "Health Education Film," 52.

assessment of the value of the maternity exercises.[63] The writer(s) concluded this time that there was a slight advantage of physiotherapy during pregnancy, but it needed balancing against the cost and labour of maintaining the service.

Clinical Medicine Committee

Hercus appears to have had little direct association with a number of the committees apart from administrative and promotional activities, as was the case with the Clinical Medicine Committee. In his role as Dean, he had a strong influence in choosing staff, seeking those with a proven track record of research. As referred to in Chapter Six of this thesis, Hercus was instrumental in attracting Horace (later Sir Horace) Smirk to the School to the first full time Chair of Medicine at a time when there was a movement in Britain towards expect such appointees to carry out research.[64] As chairman of the Committee for Research into Clinical Medicine set up in 1943, Smirk commenced 'a long-term study on the causation, prevention and treatment of hypertension and cardiovascular disorders.'[65] Following on from his studies in Egypt, he spent several years testing derivatives of thiourea on animals to observe their effects on blood pressure and physiology.[66] Smirk set up a hypertension clinic at Dunedin Hospital using trained technicians to record blood pressure, and trialled anti-hypertension

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[63] Anon., "The value of antenatal exercises: an investigation by the Obstetrical Research Committee of the Medical Research Council," *NZMJ* (1948): 378-81.

[64] Carsten Timmerman, "How does a drug become medicine? Hexamethonium and the treatment of high blood pressure, 1940s-1950s," https://www.escholar.manchester.ac.uk/api/datastream?, 159.

[65] Hercus and Bell, *The Three Deans*, 181.

[66] J.D. Sinclair, "Medical research in a growing community," *NZMJ* 78 (1973): 2. Sinclair says Smirk tested 3,000 different compounds.

drugs on patients. Some of these drugs were given to Smirk by drug companies to test for them.[67]

He showed he could get good results with hexamethonium and pentamethonium by individualising treatment regimes, despite the potentially harmful side effects of these drugs. He was also able to produce a line of rats with hypertension for experimental purposes – such a successful operation that it had produced 6,000 animals by 1964.[68] He and his team regularly published their work in several prestigious international journals and drew international attention to the School. Timmerman claims that in effect 'Dunedin became a satellite of clinical research in the British metropolis and this was not so different from British provincial universities.'[69] A colleague who had worked with Smirk commented in 1954 that 'when I returned to London, there were few specialized hypertension clinics, and none with the expertise that had been developed in Dunedin.'[70]

Neurophysiology and Neuropathy Committee

In 1944, Professor John Eccles replaced John Malcolm in the Physiology Department. Eccles had come from the directorship of the Kanematsu Institute in Sydney with an international reputation in neurophysiology research.[71] By 1945, he was chairman of the Neurophysiology and Neuropathy Committee of the MRC. He was to stay in Dunedin only until 1950 before returning to Australia, but he made a big impact on research at the School and in the MRC.

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[67] A.E. Doyle, "Sir Horace Smirk. Pioneer in drug treatment of hypertension," *Hypertension* 17 (1991): 249.

[68] Hercus and Bell, *The Three Deans*, 188.

[69] Timmerman, "How does a drug become medicine?" 159.

[70] Doyle, "Sir Horace Smirk," 250.

[71] Hercus and Bell, *The Three Deans*, 235.

> [Eccles] brought a great research impulse into the School and into his Department. … [He] published a stream of publications in [neurophysiology], which enhanced his own reputation and that of the Medical School. … This work was only made possible by the financial help of the Medical Research Council.[72]

The committee's aims were 'to promote the study of the way in which the brain and other parts of the nervous system control the limbs and organs of the body.'[73] The research focused initially on investigating cases of sciatica admitted to the Dunedin Hospital, but moved on to the exploration of acetylcholine and neuromuscular transmission, along with studies of the spinal cord. The members of the committee in 1946 represented a cross-section of the Departments of the School: William Adams from Anatomy, Murray Falconer from Surgery, Smirk from Medicine and Eccles from Physiology.

Having the MRC within the School had an influence on the teaching of students, the researchers sharing their latest findings in lectures – a habit not universally popular with the students. A former student of the early 1950s commented on Eccles as a lecturer: We as medical students knew more about neuromuscular transmission and neurophysiology, but we knew bugger-all about the physiology of the kidney, because the emphasis was on this ground-breaking research that was being done.[74]

Hercus also talked about his own research in lectures, indoctrinating the students on the need for iodised salt, for instance, and suggesting his students read the latest literature on

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[72] Ibid., 178.

[73] Medical Research Council Annual Report 1959, *AJHR* 1960, H-31B, 14.

[74] Interview with Brigadier Dr Brian McMahon, May 19, 2011.

bacteriology and preventive medicine. His habit of arriving at lectures with a big pile of books that he seldom referred to during his delivery, is much caricatured in cartoons of the time. As Barbara Heslop noted 'The books seemed as much a part of him as his clothing.' Former students believe Hercus gave his lectures 'off-the-cuff', something he was very good at, but the students did not always appreciate them. Some students described his lecturing style as dull, but some of his profound wisdoms did have a lasting impression.

Virus and Immunology Committee

Hercus and Edson convinced the MRC to set up this committee in 1945 but it functioned only briefly from 1945-47 under the chairmanship of Dr Max Richardson before being combined with the Hydatid Disease Committee as the 'Committee for Research in Microbiology'.[75] (The Hydatid Committee re-emerged as a separate entity later under Hercus.) The work of this committee was much more in Hercus's area of expertise and he always kept up-to-date with international research into microbiology. Maguire wrote in 1997 that 'Hercus' name became synonymous with the expansion of research in microbiology, both within the School and within New Zealand as a whole.'[76] When the New Zealand Association of Bacteriologists published the first issue of their journal in 1946, Hercus was one of the three examiners for bacteriological assistants' certificate of proficiency.[77] Hercus and D'Ath shared the

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[75] T. Maguire, "Microbiology," in *Medical research in Otago 1922-1997 as portrayed by 75 years of the Proceedings of the Otago Medical School*, ed. Edwin Nye (Dunedin: Otago Medical Research Society, 1998), 38.

[76] Ibid.

[77] Anon., "Bacteriological Assistants' Examination for Certificate of Proficiency," *Journal of the New Zealand Association of Bacteriologists*, 1 (1946): 5.

responsibility of conducting oral examinations of candidates. The Association elected Hercus as an honorary member in 1946.[78]

The Committee's research focused on bacteria, fungi and viruses, the work being carried out in the Microbiology Research laboratory controlled by Dr Leopold Kirschner and in Richardson's Virus Research Laboratory. Viral studies of the MRC included investigating an outbreak of psittacosis in Australian parrots imported into New Zealand in 1953-4.

Employing Kirschner was to prove a great decision that certainly paid off in terms of advancing research at the School. He was a Polish scientist who had come to Dunedin after working at the *Institute Pasteur* in Java, 'a foremost centre of medical science providing vaccines for the whole of the Dutch East Indies and being at the forefront of medical research.'[79] During the Second World War he and his wife were interned in a Japanese prison camp and on his release he came to Dunedin. Prior to his internment he had been studying leptospirosis and on his arrival in New Zealand, convinced that there would be cases of leptospirosis in a country with so many cattle and sheep, he soon found the bacteria involved and proved that the disease was here and capable of causing serious human health problems.

He and W.G. Gray published their first report on the incidence of leptospirosis in New Zealand just before the reconstitution of the MRC.[80] With his clinical skills, he discovered a method to culture these slow-growing microbes and performed serological tests that could help identify them in sera. In Java he had found leptospirosis was carried by rats and now he found it in rats in Dunedin. New Zealand's surface waters had a favourable pH for the

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[78] Ibid., "Conference of the New Zealand association of bacteriologists, 1946," 36.

[79] D.D. Adams, "Obituary: Leopold Kirschner," *NZMJ* 72 (1970): 414-15.

[80] L. Kirschner and W.G. Gray, "Leptospirosis in New Zealand: infection with Spirochaetes in animals and man," *NZMJ* 50 (1951): 342-51.

bacteria excreted from infected animals to survive in. The disease was here but not correctly identified and was causing human illness.

For the next decade, the committee investigated the incidence of leptospirosis in humans and domestic animals, its culture in the laboratory and in-depth study of the bacterium. By 1953, Kirschner was operating a ‘Leptospira Reference Laboratory’ at the School and examining hundreds of samples of sera from throughout the country. New Zealanders were catching the disease from cattle. In addition, Hercus’s students produced dissertations on the incidence of the disease in 1954 and 1955, which were likely to have provided useful data for the laboratory.

Kirschner and D. Gallagher also studied the incidence of hæmolytic streptococcal infections, identifying carriers (with or without tonsils present).[81] Peter Fleischl, one of Hercus’s students was able to add valuable data to this study, having analysed ‘1595 tonsillectomies performed at the Dunedin Public Hospital and a study of 522 school children.’[82] Kirschner and Gallagher took their study further to analyse the streptococci present in an outbreak of scarlet fever in Dunedin in 1946-48.[83]

Within Hercus’s Department of Bacteriology in 1947, researcher Mary Marples carried out a study of fungal infections in 100 cases received by the department for identification.

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[81] L. Kirschner and D.J.A. Gallagher, “Studies on Hæmolytic Streptococci, I.- Factors influencing the carrier rate of the Group A Hæmolytic Streptococcus,” *NZMJ* 48 (1949): 10-19.

[82] Peter Fleischl, “Tonsillectomy – the indications for and against: an analysis of 1595 tonsillectomies performed at the Dunedin Public Hospital and a study of 522 school children” (Unpublished Student diss., University of Otago, 1948).

[83] L. Kirschner and D.J.A. Gallagher, “Studies on Hæmolytic Streptococci, II.- A study of the serological types of Group A Hæmolytic Streptococci in the epidemiology of scarlet fever in Dunedin,” *NZMJ* 48 (1949): 159-65.

The following year, she helped Margaret di Menna investigate the efficacy of using ink as a treatment for ringworm – a common home remedy at the time.[84] (She found it did work was much less effectively than a commercial fungicide.) The MRC aided Marples in this study and in a subsequent study of ringworm infections in Otago from 1947-51.[85] She used guinea-pigs in her experiments, as well as some human one (including herself) to understand the course of the disease and the efficacy of the current treatments available. Ringworm, although a fairly minor skin infection caused much distress to children and parents, particularly because the infected children were excluded from school for up to six months and sometimes for even longer. In 1953, Marples investigated a small outbreak of scalp ringworm in an institution in Dunedin with the aim of showing that such heavy restrictions were not necessary because of the poor communicability of *Microsporum canis*, the causative fungus.[86] Infected children from the institution did not pass on the infection to school classmates because there was no close contact among them. There was little chance of spreading the disease provided laboratory tests confirmed the child's infection and treatment carried out. Further preventive measures included the child wear a close-fitting cap. 'Such a programme would materially reduce the loss of school time,' advised Marples.[87]

Island Territories Research Committee

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[84] M.E. Di Menna, "Ink in the treatment of Tinea Capitis and Corporis: Studies in Vivo and Vitro," *NZMJ* 48 (1949): 486.

[85] M.J. Marples, "Some observations on the occurrence and clinical course of Tinea Capitis and Corporis in Otago," *NZMJ* 50 (1951): 460-79.

[86] M.J. Marples, "Tinea Capitis caused by *Microsporum canis*: report of an outbreak in a Dunedin institution," *NZMJ* 53 (1954): 158-61.

[87] Ibid., 161.

While the existing MRC Committees concentrated on New Zealand health issues in the late 1940s, Hercus saw a need to expand research into the islands of the South Pacific, where he felt there was little known about the health of the inhabitants. Upon his return to New Zealand after attending the two Scientific Conferences in the United Kingdom in 1946, he proposed setting up a research base at the School to direct medical research in the islands of the South Pacific Islands.[88] It was necessary he thought, because there were no universities in these countries that could act as 'self-renewing centres of scientific research, [and] research inevitably languished [there].'[89]

Referring to New Zealand's affiliations with the Pacific Islands in a paper given at the Sixth Science Congress at the RSNZ in May 1947, Hercus noted:

> It was a natural development for New Zealand to enter in 1946 into an agreement with the United Kingdom to form a South Pacific Health Service to serve Fiji, the West Pacific High Commission, Tonga, and the New Zealand dependencies and mandated territory. … No health service is complete without a research programme and the New Zealand Medical research Council and the Otago Medical School are anxious to give practical assistance within the area covered by the Service.[90]

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[88] Minutes of a Meeting of the Medical Research Council, May 20, 1947. ADBZ 16163 H1 Box 1569 240/1/7 alt. no. 23325 (R20960285) Archives New Zealand.

[89] Hercus, "Medical research in the South-West Pacific," 303.

[90] C.E. Hercus, "New Zealand's responsibility for medical research in the South-West Pacific," *Transactions and Proceedings of the Royal Society of New Zealand* 77 (1949): 303.

With the assistance of the New Zealand Government's Department of Island Territories, a committee was established with T.R. Ritchie as its chairman. Although Hercus initially was not on the committee, he took over this role in 1950 when Ritchie retired. The Department financed the work of the Committee, which must have been a great benefit for Hercus and the School at a time of limited resources. The funding allowed groups of scientists to travel to the different islands for study in the long university vacations. 'The first trip set out in the summer of 1948/49 to Samoa.'[91] At the MRC meeting in November 1949 in his office, Hercus proposed that the government appoint a permanent Research Officer to undertake field research and work at the 'Base Laboratory' in Dunedin. Eventually, the proposal was actioned with the employment of Duncan McCarthy in 1950?[92]

Hercus led the second trip, this time to Rarotonga in 1949/50. He had received an invitation from Dr Tom Davis, a former Otago student working as Chief Medical Officer in Rarotonga:

> I requested the Dean of my Medical School, Sir Charles Hercus to send a team to the Cook Islands over the long summer university vacations to do some research to define more clearly our medical problems so that they could be tackled with greater focus. He soon responded to my request. He would head the team, which arrived over the Christmas of 1950.[93]

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[91] C.E. Hercus, "Health problems in the South-West Pacific," *Proceedings of the University of Otago Medical School* 31 (1953): 21.

[92] Minutes of a meeting of the Medical Research Council, November 3, 1949. AAFZ 412 W1318 Box 35 alt. no. 1349 (R18732099).

[93] Tom Davis, *Island Boy: an autobiography* (Christchurch, The Institute of Pacific Studies, University of the South Pacific, The Macmillan Brown Centre for Pacific Studies, University of Canterbury and the Centre

At the conclusion of his trip, Hercus co-wrote a paper with Solomon Faine on the nutritional status of the Cook Islanders.[94] This work is one of the only examples of Hercus's published material on nutrition. In surveying the population of Rarotonga, he initially faced difficulties in choosing a suitable method to assess the nutritional status of the population. The study's aim had been to assess the changes to the islanders' diet since the introduction of European food over the previous century. He was most interested in the state of the people's teeth – a continuing interest from his earlier work with the Tuhoe people in 1925-6. As he expected, he found that the soft carbohydrates of the introduced European food was damaging the islanders' teeth.

He did not find any obvious malnutrition, either by observation of physique or clinical test, but found that the rate of obesity was an important problem. He could not find an obvious cause of the obesity within the diet, 'unless it could be the apparent reliance placed on foods in the diet containing carbohydrate and fat.'[95]

His decisions on which measure to use may have influenced the work of the next trip (to Pukapuka and Manono) taken in 1950-51, and led by Dr G.O.L. Dempster and Dr Molly Marples, but the Island studies suffered from a lack of uniformity at least in the way their results were presented. When Dr Duncan McCarthy, newly appointed Research Officer

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for Pacific Studies, University of Auckland, 1992): 90. Davis wrote that Hercus's interest in the Cook Islands and Davis's career was related to the fact that Hercus's uncle, the Reverend James Chalmers had been a missionary to the Cook Islands and Papua New Guinea, whose stories had always fascinated him.

[94] Solomon Faine graduated from the Medical School in 1949. He became a lecturer in the Department of Bacteriology.

[95] S. Faine and C.E. Hercus, "The nutritional status of Cook Islanders," *British Journal of Nutrition* 5 (1951): 341.

collated all the material from the three trips in 1955, he noted that 'This lack of uniformity will be understood when it is appreciated that the separate expeditions were individually planned, conceived, and led, and that methods were left entirely to the various leaders.'[96] These problems had led the committee to appoint McCarthy, an Otago graduate, who had come from a position as Deputy Director of Medical Services in Uganda and was ideally qualified to work in the field of tropical diseases in the Pacific.

Hercus and Faine published a second paper in 1951, dealing with the infections and general health of the people in a village in Rarotonga. They reported incidences of tuberculosis and noted a lack of bovine tuberculosis (there were very few cows on the island), filariasis, intestinal helminthiasis and skin infections. They brought some samples back to the School for testing but unfortunately the formalin used to preserve the samples damaged them. They noted that: 'Although hookworm infestation is common, hookworm anaemia or hookworm disease are rare, probably due to the good state of nutrition: there must be enough extra in the diet to feed the worms as well as their hosts.'[97]

The range of participants in the three trips reflects the interests of researchers at the School and the domination of its staff in the parties: Bacteriology and Preventive Medicine personnel, Purves and Muriel Bell, a Medical Officer of Health, a University zoologist and a DSIR entomologist all acted as field staff one or more of the trips.[98] In 1959, the annual report concluded that:

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[96] D.D. McCarthy, *New Zealand Medical Research in the South-West Pacific: a report of the work done by the Medical Research Council's expeditions to Western Samoa, Rarotonga, and Pukapuka from 1948 to 1953* (Dunedin, Medical Research Council of New Zealand, 1955), 8.

[97] S. Faine and C.E. Hercus, "Infections in Rarotonga, Cook Islands," *Transactions of the Royal Society of Tropical Medicine and Hygiene* 45 (1951): 347.

[98] McCarthy, *Medical Research in the South-West Pacific*, 5.

> For the first six years, the activities of the committee consisted in the annual dispatch of long-vacation expeditions from the University of Otago to carry out both general and more intensive work on specific problems as they were identified. A number of important contributions to the scientific literature was made in consequence of these studies on such problems as nutrition, dental disease, filariasis, intestinal worm diseases, skin infections, and tuberculosis.[99]

Hercus's papers do not indicate that he or the other members of the research team offered any inoculations, medications or other practical assistance – the visit appears to have been only to observe and report. Hodge maintains that the surveys were of great value in establishing the health status of the various island populations at the time. Emphasis was almost entirely on the incidence of transmissible disease, 'but this reflected the priorities of the time and was entirely appropriate.'[100]

Projects outside the Council framework

In addition to the work of the established committees, the Council gave grants to research fellows for special projects. Victoria University's Professor of Zoology, Laurence Richardson was one of the first to receive support – for a study into the incidence of *Enterobius*

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[99] Annual Report of the Medical Research Council, *AJHR* H-31b 1959, 11-12.

[100] J.V. Hodge, "The history of MRC research support in the South Pacific," Medical Research Report, *AJHR* 1972, H-31b, 18.

vermicularis, a human pinworm. He feared that unchecked the worm could act as a vector for viral diseases. The work showed 55 percent of the people tested carried the worms.[101]

Another project initially outside the committee structure involved the study of an annoying dermatitis called "swimmers' itch." This had begun attacking swimmers in the southern lakes of New Zealand from about 1925 as swimming became more popular.[102] One of Hercus's fifth-year students, Walter Macfarlane discovered that in Lake Wanaka the larval form of a schistosome living on teal ducks caused the dermatitis.[103] Macfarlane was able to work out the complex lifecycle of the parasite and study the allergic reaction in humans.

Hercus encouraged the study by this mature student who already had a zoology degree: 'Dr Hercus was attacked in 1933 and became interested in the cause of the dermatitis,' Macfarlane wrote, and had filtrates of the water studied but could not find the culprit.[104] Hercus no doubt welcomed Macfarlane's discovery and subsequent later attempts to rid the lake of this parasite by adding copper sulphate to the weed beds that harboured the snails that acted as intermediate hosts of the schistosome.[105] The successful experimental disinfection of

[101] L.R. Richardson and Elizabeth Clark, "Studies on the incidence of *Enterobius vermicularis* (Linn.)," RSNZ Report of the 6th Science Congress 1947, in *Transactions & Proceedings of the Royal Society of New Zealand 1949* (Dunedin, ODT & Witness Newspapers): 245-47.

[102] W.V. Macfarlane, "Schistosome dermatitis in the Southern Lakes: an investigation of swimmers' itch," *NZMJ* 43 (1944): 136.

[103] Anon. Walter Victor Macfarlane 1913-1882, Australian Academy of Science – Biographical Memoirs http://science.org.au/fellows/memoirs/macfarlane.html Macfarlane took up a lectureship at Otago in 1947 but left in 1948 to become Professor of Physiology at the University of Queensland. His dissertation is not in the Medical School library's collection.

[104] Macfarlane, "Schistosome dermatitis", *NZMJ* 43 (1944): 136.

[105] W.V. Macfarlane, "Investigation into schistose dermatitis (swimmer's itch) in the Southern Lakes." ABQU 632 W4452 Box 1396 245-34 alt.no. 61370 (R16659989) Archives New Zealand.

Roy's Bay at Lake Wanaka in December 1948 was a direct result of this study and partly financed by an MRC grant. Macfarlane's project was placed under the control of the Microbiology Committee in 1948. The work appears to have carried on by the government until the early 1950s with the Health Department paying for some of the copper sulphate required.

Restructuring of the MRC

The MRC continued to function for several years within its unsatisfactory structure, the number of committees growing and the range of research projects expanding. All was not well, however and by 1947, members resolved to approach the Minister of Health to consider 'the question of constituting the Council as an independent statutory body receiving an annual grant from the Government.'[106] They criticised the 'vague' legal status of the Council and its progress on preparing a Medical Research Council Bill advanced slowly with members given copies of a draft Bill in at the May meeting in 1948, followed by printed copies at the September meeting.

> On the motion of Sir Charles Hercus, seconded by Dr Lynch, the following resolution was carried unanimously:- The Council desires to record its appreciation of the action of the Hon. the Minister of Health in authorising the preparation of the Medical Research Council Bill and desires to assure the Hon. the Minister that all the members of the Council will unanimously support the passage of the Bill through Parliament and

[106] Minutes of MRC Meeting 16 September 1947. ADBZ 16163 H1 Box 1569 240/1/7 alt.no. 23325 (R20960285) Archives New Zealand.

> trusts that the Hon. the Minister will be able to bring about the passing of the measure at an early date.[107]

This was not to be: the Bill was still languishing in November 1949. What may have spurred the government into action was a visit to New Zealand by Sir Henry Dale, formerly director of the *National Institute for Medical Research* in Hampstead, and a member of the British MRC. Hercus took on the responsibility of finalising arrangements for Sir Henry to meet members of the MRC at a special meeting at the School in March 1950. Dale outlined the history of the British MRC and lessons learned, which he felt would help the New Zealand situation, and generally approved of the Bill.[108] He felt the expenditure on medical research here was quite inadequate.[109]

By August 23, 1950, the Bill had reached the House of Representatives, where it was subjected to lengthy debate, during which the Minster of Health, Mr Watts reported that Sir Henry had addressed a Cabinet meeting and met Watts for two other meetings. The debate in Parliament ranged widely, often acting as a platform for members to air their grievances about the state of health of the Maori population, the poor state of teeth of New Zealanders or the need for physical education for youth, but there was consensus for support of the Bill. It is interesting to note that Hercus was delivering the *Second Hudson Lecture* to the Wellington Branch of the Royal Society the same evening of the debate, a fact that he reported to his

[107] Minutes of MRC Meeting September 7, 1948. AAFZ 412 W1318 Box 35 (R18732099) Archives New Zealand.

[108] Minutes of a special meeting of the Medical Research Council, March 15, 1950. ADBZ 16163 H1 Box 1569 240/1/7 alt.no. 23325 (R20960285) Archives New Zealand.

[109] "Medical Research Council Bill," *NZPD* August 23, 1950: 1779. The sum proposed for 1950 was £33,000, an increase from £20,000 in 1947.

audience.[110] The Medical Research Act came into force on April 1, 1951 and the newly constituted MRC met in May. The chairman noted: 'With a few changes the Council has taken over and will continue the organization which had (sic) been built up by its predecessor.'[111] The Act established a Medical Endowment Fund to assist travel expenses and allowances, as well as limiting the period that the members could serve on the Council. The mix of representatives on the Council was slightly different from those on the earlier body and there were ten members, not eight.[112]There were nine research committees, and Hercus was chairman of two (the Endocrinology Research Committee and the Island Territories Committee), and a member of the Microbiology and Nutrition Committees. The School accommodated all but the Dental and Tuberculosis Committees.

The structure of the new Council and its committees owed a lot to Hercus's efforts to establish and maintain the MRC for the 13 years of its existence to date. It acted as a model for the new organisation, with the successful projects carrying on. As Hercus wrote: 'Despite these limitations [of lack of legal status, no security of tenure or superannuation benefits], in typical British fashion, the Council has functioned and has been able to secure research workers of high ability whose record of work has been most encouraging.'[113]

Within the earlier structure of the MRC there were some projects that did not succeed, such as a Psychiatric Research Committee, which functioned for only two years, although another version was formed in 1959. Some experienced name changes – such as the Committee for research into 'Chest Diseases' replacing 'Tuberculosis' in 1954, and new ones

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[110] Hercus, "Second Hudson Lecture," 108.

[111] John Cairney, Medical Research Council First Annual Report and Statement. *AJHR*, H-31, 1952, 1.

[112] Medical Research Council Act, 1950, no.20. Statutes of New Zealand.

[113] Hercus, "Second Hudson Lecture," 107.

began including committees to investigate Toxicology in 1953, and Surgery in 1955. In addition, Hercus reconstituted the Hydatid Disease Committee in 1956, as mentioned in Chapter Five of this thesis.

The Endocrinology Research Committee

While it is beyond the scope of this thesis to follow all the research projects, the work of the endocrinology researchers warrants inclusion as it represents the extension of Hercus's initial goitre research into the 1950s and beyond. With time, new laboratory techniques evolved allowing researchers to study thyroid and pituitary functions, such as the use of radioactive iodine, which became available after wartime research into atomic physics. Duncan Adams, employed as research fellow in 1951 in the Endocrinology Unit, sought a more fundamental research project than developing technology for the diagnosis and treatment of thyroid disease. He decided upon investigating the aetiology of 'Graves' disease, or thyrotoxicosis, where the thyroid is overactive and kills people.'[114]

After three years of experimenting, Adams and Purves developed a successful assay to determine whether levels of Thyroid Stimulating Hormone (TSH) were higher in the blood of people with Graves' disease – using guinea-pigs and radioactive iodine (^{131}I).[115] One patient exhibited an unusual reaction that led to the discovery in her blood of a 'long-acting thyroid stimulator' (LATS), a finding soon to be confirmed by others and for which Adams received the Van Meter Prize of the American Goiter Association in 1948. Few researchers accepted then that autoantibodies existed, but Adams and Purves had shown that they did, showing that

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[114] D.D. Adams, "Long-acting thyroid stimulator: how receptor autoimmunity was discovered," *Autoimmunity* 1 (1998): 3-9.

[115] Ibid., 6-7.

Graves' disease was an autoimmune disease. Adams spent the rest of his career working in the Endocrinology Unit on autoimmunity and related topics.

Other research projects

In addition to the MRC research projects, there was also research in the different Departments at the School during Hercus's Deanship, but it is quite difficult to separate these from the MRC projects before 1950. Up until 1951, many of the papers about the findings of these projects were published in full in *The Proceedings*, with 26 papers in the final edition of the journal in this format, including two of Hercus's student dissertations and his *Second Hudson Lecture*.[116] The papers were mostly reprints from the *New Zealand Medical Journal* and various international journals.

With the formation of the Otago Medical School Research Society in 1951, *The Proceedings* became a much smaller publication (often of only eight pages), now subtitled *Communications*, which presented only unpublished preliminary work.[117] Hercus contributed a paper in special edition in August 1953 focusing on medical research carried out in the South-West Pacific.[118] Hercus and Bell wrote in 1964:

> In 1950 it was decided to form a research Society for the purpose of the hearing, discussing and publishing of research papers. This society meets at regular intervals to

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[116] *Proceedings of the Otago Medical School* 28 (1951). In this volume were papers from the Departments of Psychiatry, Anatomy, Neurosurgery, Medicine, Surgery, and from the Dunedin Hospital.

[117] Anon. Otago Medical Research Society http://omsrs.otago.ac.nz/pages/history.html

[118] C.E. Hercus, "Medical Research in New Zealand's Island Territories," *Proceedings of the University of Otago Medical School* 31 (1953): 21-2.

hear and discuss papers and it publishes *Communications,* which have now reached the 41st volume. These *Communications* enable a wide circulation of research findings to be available internationally.[119]

The early 1950s thus saw quite substantial changes in the research at the School and the way in which researchers presented their findings. The Research Society appears to have made sharing these results a social occasion with an increased audience attending the regular meetings. Contributors included the Travis Laboratory, the Hugh Adam Department of Cancer Research, the MRC groups and staff from the different Departments of the School.[120]

Hercus maintained positions on the Council in an ex officio manner until 1959 and as chairman of the Endocrinology and Island Territories Research Committees, as a member of the Microbiology and Nutrition Research Committees until the same date. He was still acting to find funding throughout the 1950s as evidenced by his work with an Australasian funding body, as mentioned below, but his hands-on period of practical research was largely over. His major role in research had been in establishing the MRC and keeping the bulk of the research projects within the School, and meeting the needs of the researchers. This task took him on frequent visits to Australia to meet representatives of a new Trans-Tasman medical research fund.

The Life Insurance Medical Research Fund

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[119] Hercus and Bell, “The Three Deans,” 186.

[120] Ibid., 199. The laboratory was named after Hugh Adam who had bequeathed School £48,000 for research into cancer and allied diseases in 1940.

From 1953 to 1960, Hercus served on The Advisory Council of *The Life Insurance Medical Research Fund of Australia and New Zealand*, which was set up in 1953 to help fund research in both countries.[121] He travelled regularly to Sydney in connection with this role, 'at least annually, which gave [him] the opportunity to visit all the Medical Schools of Australia.'[122] Noting the opportune timing of the establishment of the Fund, Professor B.C. Sinclair-Smith, the Medical Director, said:

> An epoch has passed in which the descriptive phase of clinical phenomena was to be replaced by research into basic mechanisms of disease. Peacetime inquiry posed many questions as to the nature, significance and conquest of the prime killers: hypertension, atherosclerosis and structural heart disease.[123]

In New Zealand, the Fund contributed to Sir Horace Smirk's research in cardiovascular function and disease from 1954. The Fund managers had chosen cardiovascular research as the first field of research to receive grants and provide fellowships.[124] The funding allowed Smirk to employ research workers both medically and scientifically qualified.[125] Smirk's project on the pathogenesis of hypertension was one of the Fund's major areas of support from 1954-67.[126]

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[121] Ibid., 67.

[122] Ibid.

[123] Life Offices' Association for Australasia, *Life Insurance,* 8.

[124] Ibid.

[125] Hercus and Bell, *The Three Deans*, 277.

[126] Ibid., 25.

Hercus and physical education

Hercus was to make yet another major contribution to improving public health through campaigning to have teachers trained to teach physical education to school children in 1937. His plan was to set up a national college in Dunedin in association with the School to train school teachers in physical education. He believed that 'physical training was probably the biggest defect in the schools of New Zealand at the present time and there was no specialisation or special attention directed to this important aspect of education.'[127] He argued for such an institution to be located in Dunedin to be near the School. A few days after newspapers reported his speech in the *Auckland Star*, a correspondent representing the *Physical and Mental Welfare Society* supported his scheme but warned that more exercise meant the children would have bigger appetites, and hence would need better nutrition, which in turn would mean establishing a national scheme of nutrition.[128] Yet another correspondent thought using retired physical instructors trained for the last war, would be a better option.[129]

By November 1937, Hercus had presented a proposal for a course in physical education to the Professorial Board of the university at the same time as the House of Representatives was discussing the Physical Welfare and Recreation Bill, based on an English Act passed this year.[130] The Act became law in 1937 and a Director of Physical Education in the Schools appointed but not until 1939. Following the passage of the Act, the National Council of Physical Welfare was set up to act in an advisory role to the Government on 'encouraging,

[127] "Special College?" *The Auckland Star*, April 5, 1937, 9.

[128] "Physical education?" *The Auckland Star*, April 10, 1937, 8.

[129] "In the public mind: physical training," *The Auckland Star*, April 14, 1937, 6.

[130] "Proposed course in health and physical education." ARC-0193 94-121 43, 1937; See Macdonald, *Strong, beautiful and modern,* for a more in-depth discussion on the British National Fitness movement and the Physical Training and Recreation Act 1937.

promoting and controlling physical education, training, sport and recreation among the people.'[131] Hercus was appointed one of the 12 "Non-official members" and the only representative from Dunedin. At the first meeting of the Council:

> Dr Hercus stressed the view that the objective was not merely physical fitness per se; there was a very much bigger end, because the whole question of healthy citizenship was involved. In the work on which they were to embark there was much leeway to be made up, and he felt that the council had been set up none too soon.[132]

Hercus's proposal for a physical education course was unresolved when Hercus left for Britain, Europe and the USA in 1939. One of the highlights of the trip was attending the Lingiad in Stockholm in July 1939, which he believed 'revealed the great potentialities for health of a well-balanced national scheme of physical education.'[133] He noted schemes in Britain aimed at improving their physical and social education at well-equipped gymnasia, and Civilian Conservation Corps camps in the USA. 'The movement appeared to me to be sound and to embody to some extent the better features of the Hitler Youth Movement', he wrote.[134] His own contribution after the war was over, he suggested, could be to supplement any policy of the Minister of Education enacted to make facilities in post-primary schools

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[131] "Sport Council," *The Evening Post*, May 2, 1938, 9.

[132] "Physical Welfare: National Council first meeting today," *The Evening Post*, May 24, 1938, 12.

[133] Hercus, *Wilding Memorial Lecture*, 4. Hercus found attending the Lingiad (an international display of gymnasts celebrating the centenary of the death of the Swedish gymnast P.H. Ling) a memorable experience and 'it was with reluctance that I turned from this theme to the topic of his lecture on women in education and society in relation to their unique function of child-bearing,' he said at the start of the address.

[134] Ibid., 23-4.

available to people until age 21, by 'instituting annual camps of at least one month's duration, using the present military training camps, where cultural and physical education can be continued more intensively.'[135]

Over the next few years, Hercus corresponded with Philip Smithells, head of the Physical Education Branch of the Department of Education set up in 1939, on plans to set up a School of Physical Education in Dunedin.[136] The discussions concerned the work that Hercus thought 'a real physical educator should do, not only in the schools but also in the community…', and in finding suitable accommodation for the School. He argued that his students were constantly meeting minor physical defects in the school children that they examined in the Health Clinic and there was nowhere that these would be treated in Dunedin. The remedy would be the establishment of a new School, as Morrell wrote:

> In May 1947 Mr P.A. Smithells M.A. (Cantab.), … Superintendent of Physical Education in the Education Department accepted the Directorship and in March 1948 the School opened … A Board of Studies in Physical Education was set up, but there was no special association with the Medical School, as had originally been suggested. It was, however, Sir Charles Hercus, more than any other man, who had secured this new Special School for Otago.[137]

Some of Hercus's students chose to carry out study for their dissertations in co-operation with the School of Physical Education, such as McMahon in 1954 and an unnamed student

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[135] Ibid. 24.

[136] Smithells, Philip Ashton, Professor, Papers. ARC-0494 MS-1001/153

[137] Morrell, *Centennial History*, 165

carrying out a survey of '800 pairs of children's feet,' along with a physical education student – in a room set aside for individual attention.[138]

Conclusion

This chapter illustrates some of the multitude of roles that Hercus played over the years following the Second World War, an event that changed the focus of public health in New Zealand. A country so far from its source of important foodstuffs now faced shortages that were seen to have serious health effects on the young, such as a lack of oranges and cod liver oil. These were not the only nutritional problems facing the country, as milling practices affected the quality of flour as proven by research for the MRC. Nutritionists deemed the average New Zealand diet in the 1940s unsatisfactory to the point that the MRC produced an informative booklet and attempted to educate the population to adopt a healthier diet. This would have the bonus of reducing dental caries, they hoped. Nutrition research expanded in the School aided by better accommodation secured for the researchers by Hercus in the Hercus Building.

His strong advocacy for the erection of this building was a major factor in bringing so much of the work of the MRC into the School even after 1951 reconstitution of the council. The new building contained a dedicated area for the care and breeding of laboratory animals, and Hall's expert services as an expert technician. Hercus countered concerted efforts by anti-vivisectionists and defended the use of laboratory animals as a means to improve human health by co-operating with SPCA inspections and public statements in the Press. The animal breeding programmes produced unique breeds of mice, publicity about which helped ensure

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[138] McMahon, "Comparison of the attitudes towards and experience in childbirth of trained physical educationists"; Smithells to the Director of Education, October 5, 1950. ARC-0494 MS-1001/153.

the reputation of the School as an important research institution. Scientists such as Australia's Sir Macfarlane Burnet recognised the potential of these animals for his immunology research, as did the School's own researchers such as Adams, Heslop and Woodruff.

By 1951, the areas of research within the MRC and the School widened and became more specialised with the passing years. The focus of the student dissertations followed the trend of the work of the Department of Health with more emphasis on industrial health that matched the increase in the number of people engaged in this kind of work. The move away from agriculturally based research was not complete, with the MRC, Hercus and his students continuing research into hydatid disease and leptospirosis. Research into endocrinology secured a worldwide reputation for excellence for Purves and Adams, work which had its origins in Hercus's research into endemic goitre.

One of Hercus's prime targets for improving public health was to increase physical fitness, one that he considered he had largely reached with the establishment of the School of Physical Education in 1948. He had been encouraged to foster this move by experiences he had on his trip to Britain and Europe in 1939. A later trip inspired his taking research to the Pacific Islands, where local populations would derive benefits of research undertaken at the School. In the 1950s, Hercus's role shifted more towards giving prestigious lectures on the research and as always, using his bargaining skills to provide adequate funding for the work to continue and develop. He secured the backing of the Life Insurance Medical Research Fund to promote important research into hypertension.

He had helped create the MRC and ensured its researchers could largely carry out their work within the School, thus forestalling the establishment of any other medical research institute in the country at the time. The MRC began as a copy of the British MRC, following the same route via a committee of the Department of Health to an independent council, but with strong ties to the Department. The MRC was important in New Zealand in that it provided a framework for medical research to take place and the funding to do it. This thesis has presented Hercus's contributions to the setting up and successful operation of the MRC.

Chapter Eight: Conclusion

After the War, Dunedin entered into a period of extraordinarily creative medical research whose flood lasted about 15 years.—P.G. Robinson, 1975[1]

[Hercus] never wavered from the view … that medicine depended upon the integration of many talents, both human and scientific. – G. Parry, 1975[2]

The period referred to by Robinson (above) encapsulates the most outward-looking and effective years of Hercus's career in regard to expanding reseach within the School and the MRC.[3] During these years, Hercus gave prestigious lectures at conferences in Canada, the UK and New Zealand that revealed the extent of medical research that he had fostered while also Dean at a School growing in size and complexity. His extraordinary drive and strength of character allowed him to focus on building a research culture in addition to his other roles.

The impetus for his interest in medical research came early, even before he had finished his dental degree, inspired by Pickerill. This thesis has shown that Pickerill's influence was long lasting and an inspiration for Hercus to study Maori health and anthropology. This typified Hercus's passion for learning which he exhibited throughout his career. Hercus considered himself a student all his life and encouraged his students to be the same. Hercus's

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[1] P.G. Robinson, "The Otago Medical School, 1875-1975," *BMJ* 1 (1975): 381.

[2] Parry, *Otago Medical School*, 34.

[3] Ludbrook, "Medical Schools of the year 2000," 133. John Ludbrook, Professor of Surgery at the University of Adelaide in 1975 claimed that 'From the mid-1930's to the mid-1950's, it would be difficult to identify another medical school anywhere in the world that was producing a greater quantity and quality of research publications.'

daughter Mary recalls that he was interested in everything, and was seemingly always one step ahead of her when she discussed her university studies with him.

This thesis aimed to identify how serving as a military medical officer for five years affected Hercus's choice of career. But for the intervention of the First World War, it has been suggested that Hercus may have become a surgeon.[4] To date, New Zealand historians have given little attention to Hercus's achievements in the First World War, perhaps due to the reticence with which he wrote on the subject, making finding original records difficult. This thesis has shown that he did share some reminiscences in correspondence with former students and contributed articles to student publications and to the official records of the different regiments he served with. Hercus learnt much about tropical diseases and their prevention, as well as gaining more experience in general bacteriology that was to form a large part of his teaching role at the School. Adams considered that a motivating factor for Hercus to undertake medical research was his dissatisfaction with the effectiveness of the measures medical officers had at their disposal in the First World War and the desire to improve them.[5]

It would appear that Hercus's participation in the Medical Corps of the Army, which extended well into his career, was instrumental in his choosing to take up public health as a discipline. Even after making this choice, he would have preferred to stay in the Army where he had learned leadership skills and earned the respect of many of his superior officers. Hercus continued to give service to the Army through training medical students in the

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[4] Adams, "Medical School 'Hercus Building.'" Adams wrote that Hercus had intended to become a surgeon.

[5] Ibid.

OUMC, but this is a subject beyond the scope of this thesis.[6] It transpired that the Army's loss was the School's gain and resulted in his having one of the most diverse medical careers in New Zealand's history. His prestigious war record set him in good stead with government officials as well as medical and science organisations and ultimately to his position at the School. This thesis has illustrated how his interest in the work of George Newman also aided his application for his professorial role in 1922 and how he incorporated Newman's ideas into his teaching.

This thesis has shown how Hercus established his research into endemic goitre and promoted research into many of the pressing health problems facing the country, such as preventing childhood infectious diseases. Hercus was able to be active in several different fields of research because it was still a period before medical research became overly specialised.

In 1944, John Ryle, Chair of the Oxford Institute of Social Medicine, defined the evolution of medicine over the past century into 'three distinct, if overlapping disciplinary periods.'[7] The first was over by the turn of the twentieth century and was characterised by the "pathological disciplines" 'concerned with disease rather than with man in disease.' Hercus's career began in Ryle's second phase – that of "experimental or laboratory disciplines."[8] In this era, laboratory research had discovered many new biological compounds, derived from

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[6] D2/2023 Lt Col. Hercus, Chas. Ernest, NZDF Archives, Trentham. Hercus received a Colonial Auxiliary Forces Long-Service Medal in 1930, and relinquished command of the OUMC in 1949; Caswell, "Overdose of refugees". Caswell claims that 'Hercus went as far as to suggest to the University Council in 1941 that those students who refused to serve in the armed forces be prevented from studying medicine.'

[7] Ryle, "Social medicine as a discipline," 108-9.

[8] Ibid.

animal sources, which offered understanding of how the human body functioned.[9] These included vitamins, hormones, insulin, and thyroid extract; the latter derived from sheep and used to treat hypothyroidism.[10] The research carried out by Hercus and his colleagues fitted this definition, with ongoing projects into the understanding and prevention of infectious disease as well as the study of the thyroid gland.

Later, Hercus's interests began to reflect the features of Ryle's third period – that of technological disciplines, characterised by the invention and use of innumerable diagnostic instruments and techniques, which had the adverse effect of distancing the patient as a person from the procedures. Ryle's emphasis was on making 'social medicine' a discipline in its own right and included 'industrial medicine', a field increasingly being chosen by Hercus's students for their dissertations in the 1940s onwards. Hercus defined social medicine as taking into account 'everything that has a bearing on the welfare of mankind. … This included 'Education, Nutrition, Economics, Epidemiology, Legislation, Sociology, Rehabilitation, Health Organisations, Therapeutic Medicine, Physical Welfare, Mental Hygiene, Town Planning and Housing, and indeed any factor … that affects the quality of living.'[11] In his *Wilding Memorial Lecture*, he collated a number of statistics on the population of New Zealand to discuss women in education and society in relation to childbearing. In his talk, Hercus conceded that the subject went beyond scientific disciplines to encompass religion, education, history, sociology, law and political economy. This sounds very like Ryle's definition of social medicine, indicating that Hercus was looking at this as early as 1940, several years before Ryle's address and some time before putting it in the

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[9] Kirk and Worboys, "Medicine and species," 569.

[10] W.F. Bynum, ""C'est un malade," 411.

[11] Brunton, "Medicine of the future," 90.

curriculum for preventive medicine. Brunton discusses Hercus's interest in the concept of social medicine extensively in his book, *The Medicine of the Future*: *A history of the Department of Preventive and Social Medicine*, and argues that it gave Hercus 'the conceptual umbrella for the development of physical education' and the Health Clinic in the Medical School.[12]

Throughout his career, Hercus recognised the need to improve physical fitness, from his early inspection of recruits in 1914, to his encouragement of physical education in schools in the 1940s, leading to the establishment of the School of Physical Education. In this, he reflected his early influence by the National Efficiency Movement. The Depression of the 1930s and the Second World War also influenced the types of medical research that Hercus and other researchers at the School would choose to carry out. When the country was deprived of foodstuffs during the Second World War, researchers with the MRC found innovative ways to provide for the population.

This thesis aimed to show how important Hercus's role was in establishing the MRC and presents evidence that he was instrumental in its formation, a fact either not known or perhaps accepted by all commentators. An anonymous editorial writer for the *New Zealand Medical Journal* presented a history of medical research in New Zealand in 1961 without once mentioning Hercus by name, merely mentioning that the Dean of the Medical Faculty was a member of the MRC.[13]

Throughout Hercus's career, lack of funding was a big determinant for whether research projects could proceed. Hercus was recognised as a skilled and successful operator in obtaining funding, which was a vital trait for a facilitator of medical research. Not everyone

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[12] Ibid., 90-91.

[13] Anon., "Medical Research in New Zealand," *NZMJ* 60 (1961): 403-405.

was impressed by this ability of his, referring to his activities as 'wheeling and dealing at the highest levels', or even 'ruthless' in his attempts to get the best funding for the School, especially when it appeared that the School was receiving more than its share of university funds. In his quest to extend and improve the School, Hercus managed to offend a number of university staff, including Jock Hayward, Registrar from 1948-1974.[14] When the University Grants Committee (UGC) was established in 1948, funding for buildings was not automatically included and the two special schools – the Medical and Dental Schools were not bound by the agreement. Page recorded that:

> Hercus persuaded the UGC to use £35,000 that had accumulated in salary savings from unfilled posts over the previous four years to erect a single-storey building of about 5,000 square feet as temporary accommodation for Surgery and Obstetrics and Gynaecology. The UGC objected, arguing that because the Medical School had accumulated reserves, it should not get the large increase in its grant that it had requested.[15]

Hercus believed he could justify this because the money was being used to maintain the health of the nation. He had full-time staff coming and they needed accommodation. Eventually 'the Government backed down and the building opened in June 1956.'[16] Hayward criticised Hercus for using money for one purpose and used for another, an action he believed marred Hercus's reputation with the UGC. Hercus 'was a Medical School Man' and not

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[14] John Hunter interview with Jock Hayward, November 22, 1991. Cotter Medical History Trust, Hercus file.

[15] Page, *Anatomy of a medical school*, 153.

[16] Ibid.

really a university man. Hayward also disapproved of Hercus's 'direct access to the Ministers and everybody.'[17]

Another case in point was Hercus's decision to request a larger share of the Travis Bequest, as mentioned earlier in this thesis. With little funding available from the 1920s to the late 1950s, Hercus made the most of the opportunity to foster research at the School. He appears to have succeeded in garnering most of the funds over the years. As Robinson said in 1975, 'Hercus was able to extract ever increasing support from the government to finance the surgical research unit in 1956. Eventually 80 percent of the budget was a direct government grant.'[18]

Hercus was able to encourage research at the School to the extent that he did by persuading others to help, not only his senior students. Numbers of medical students were static for much of the time when Hercus was carrying out his early research, which was an advantage compared with similar Australian Schools with ever-increasing rolls.[19] He rarely carried out any project that did not include assistance from other people and organisations. In his role as Professor of Bacteriology and Public Health ('Preventive and Social Medicine' in 1954) he managed his teaching duties while still carrying out research by co-opting the Dunedin Medical Officer of Health to take some lectures and by sharing teaching and practical classes with Dr Morris Watt, who acted as his Sub-Dean from 1937.[20] Hercus's

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[17] Hayward interview.

[18] Robinson, "The Otago Medical School," 381.

[19] Wood-Jones, "Medical research in Australia," 100.

[20] Carmalt Jones, *Annals*, 24 and 250. He wrote that Watt was 'Dean's Associate' in 1937 and 'First Assistant to the Professor of Bacteriology and Public Health in 1939.

presence in the department that Barbara Heslop commented: 'Hercus virtually did it all. He might have had a Sub-dean but we were totally unaware of who it was.'[21]

Doing the work of four or six men, as Hercus was said to do, eventually led to problems within his department as he could afford less time to teaching. Students were not impressed by his serious lecturing style, describing it as 'dull', 'unusual' or even 'terrible'. Most agreed that the fifth year was unchallenging and by some, 'a waste of time', reflecting an overdue need to restructure the curriculum.

Professor Cyril Dixon, who succeeded Hercus in the Department of Preventive and Social Medicine strongly criticised the state he found the department in – lacking resources and the lectures farmed out to local Health Department officers.[22] Page commented that Dixon also criticised the 'cumbersome deficiencies of many years' and the fact that the staff 'had been much too involved in work of a non-academic nature.'[23]

Dixon was critical of the way that students were carrying out their dissertations with many copying work done by others and often with only one hard-working student doing the work for a group.[24] He believed that Hercus was just too busy to supervise these dissertations in his later years. Dixon instituted stricter guidelines to ensure this valuable programme survived.

Through his close association with government departments, such as the Department of Health and branches of the DSIR, as well as parliamentarians that he lobbied for funding and support, Hercus was able to extend the research work at the School. As noted earlier in this

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[21] Heslop, Interview.

[22] Cyril Dixon, personal communication 2011.

[23] Page, *Anatomy of a medical school*, 164.

[24] Dixon, personal communication.

thesis, one Medical Officer did not always agree with Hercus's intervention in local health matters, however.[25]

The government backed his plans to develop the MRC and locate the majority of programmes within the School. He built up his research capacity by instituting the student dissertation programme, a task that had positive effects for many students including leading to their taking up careers in research. Another important way in which Hercus promoted research at the School was through his seeking out and employing proficient researchers, as shown in this thesis.

One of Hercus's major contributions to research was his recognition of the importance of providing laboratory animals for research at the School, including early attempts to make vaccines against poliomyelitis. He defended the use of these animals against much opposition while recognising that although 'immense advances have resulted in the direct application of the results of experiments on the lower animals to man … [it] is becoming evident that the method of direct controlled experiments must be used.'[26] He wrote in 1950 that several conditions should be met for such experiments on humans, such as first to do no harm, never exceed what the researcher is prepared to carry out on himself and to confine the studies to volunteers.[27]

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[25] See Chapter Five of this thesis.

[26] Hercus, "Second Hudson Lecture," 106. Note also Hercus and Purves's self experimentation using bichromate mentioned in Chapter Four of this thesis.

[27] Ibid.

Prior to the formulation of the Nuremberg Code at the end of the Second World War, 'there was practically no professional or public governance of human experimentation.'[28] Experimentation on humans had been considered acceptable from the late 1800s if it were not harmful to them to any extent and had therapeutic potential.[29] In 1907 Sir William Osler wrote that 'every dose of medicine is an experiment as it is impossible in every instance to predict what the result may be', and insisted that experiments must first be tried on animals and the experimenter must obtain the consent of the subject. Rothman claimed that in the US, the medical profession was unwilling to draw attention to ethical misdeeds for fear of alarming critics such as 'the outspoken members of anti-vivisection societies,' who could use such ammunition to 'subvert the entire research enterprise.'[30]

Despite Osler's advice, it was common for researchers to use human subjects unable to give consent. 'Between the wars, attitudes to issues, such as patient consent, seem grossly negligent by today's standards,' wrote Lawrence in 2006.[31] 'The use of patients to try out new procedures and drugs without asking permission, unless anything obviously dangerous was being attempted, was commonplace, even the norm in these years.' In this Hercus acted no differently, using institutionalised orphans and mentally disabled patients in his goitre research. The aim of this work was therapeutic and so would have been considered ethical

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[28] David J. Rothman, "The Nuremberg Code in light of previous principles and practices in human experimentation," in *Human Experimentation and Research*, ed. George F. Tomossy and David N. Weisstub (Dartmouth: Ashgate, 2003), 91.

[29] Ibid., 92.

[30] Ibid., 94-8.

[31] Christopher Lawrence, "Continuity in crisis: medicine, 1914-1945," in *The Western medical tradition 1800 to 2000*, ed. W.F. Bynum et al. (Cambridge: Cambridge University Press, 2006), 309.

according to the standards of the day as would Scott's osteology studies and Pickerill and Champtaloup's dental surveys mentioned in this thesis.

This thesis contributes to the historiography of scientific and medical research at the School and within New Zealand over the first 50 years of the twentieth century not only by illustrating Hercus's extraordinary career and impact on medical research but also in portraying some of the major developments of New Zealand's research culture. It has shown how the DSIR developed ahead of the MRC, some of the personnel involved, and Hercus's advocacy for medical research. The major strength of using Hercus as a lens through which to study the development of a national research culture was to show how one man had such a large impact on medical research that spread far beyond the confines of 'medicine' to embrace other scientific disciplines also developing in the early twentieth century in New Zealand. These included agrarian studies and geological investigations, in their infancy in the 1920s and 30s when Hercus was carrying out his own research into endemic goitre.

Of the 22 subjects included for discussion at the 32nd meeting of the ANZAAS in 1957, just prior to Hercus's retirement, there were fewer than half that Hercus would not have been involved with during his career, either through his own research or through that of his students.[32] His work was allied to aspects of the fields of soil science, chemical engineering, agricultural science, the dairy industry, entomology, the climate, geological science as well as Maori and Polynesian studies. Some of the early geological surveys carried out in New Zealand were inspired by his goitre studies as were soil analyses for iodine. His students investigated many aspects of industrial hygiene, not only widening his interest and knowledge of chemical processing being carried out in this country but also perhaps offering

[32] Callaghan, *Science in New Zealand.*

helpful advice. The subject of public health was so inclusive that few areas of people's lives and occupations were not subject to his and his students' investigation.

Hercus and his researchers were involved with the early use of radioactive iodine and he he studied Coleridge and Farr's work on the radioactivity in Christchurch waterways. Widening this thesis to include a study of the NZBECCS's grant to set up the Travis Radiophysical Laboratory in the 1930s would no doubt show further connections with Hercus, his staff and students. He was not involved in oceanography though he was interested in the early research into nutritional values of locally-caught fish by his colleagues Malcolm and Muriel Bell and by his student's analyses of fish for their iodine content. He was also instrumental in developing seameal products for preventing goitre.

One would need to look elsewhere for the history of the other topics discussed at the ANZAAS meeting, such as the development of hydro-electricity, geothermal power, climatology, native and introduced birds, or Trans-Tasman relationships in natural history. Even so, for one man, Hercus had an extremely wide interest and involvement in the history of science in New Zealand. His strengths lay in creating networks to facilitate research, provide the facilities needed to carry out the work and his ability to employ talented researchers. He was 'a man of his time' able to shine in managerial roles in wartime and in peace in a small country with limited numbers of scientific colleagues.

In restricting my study to Hercus's role in fostering medical research and helping to develop the MRC, I have not been able to include in-depth investigations of the work of contemporary scientists to any great extent. This could be seen as a weakness in studying the origins of New Zealand's scientific research culture through the actions of one man, but keeps this thesis within manageable bounds. It has shown that Hercus was constantly conferring with scientists in other institutions throughout this country and others to advance his research, enhancing the School's reputation for carrying out medical research. Hercus has been shown to have had a huge capacity for work and drive, factors essential in the role he carved out for himself at the School. Although not covered specifically in this thesis, Hercus acted on many boards through which he could have influence in a wider sphere.

During the first half of the twentieth century the position of the Dean of the School was a very important and influential one. There is little doubt that as Dean his views were published widely in newspapers and discussed in parliament. He held the position for twenty-one years but had begun to have an influence on public health for fifteen years before that. Over this period New Zealand science began to develop with the establishment of the DSIR and the Cawthron Institute, both bodies that Hercus had an association with, as well as the Department of Agriculture, whose staff was also involved in scientific research. It is possible to locate Hercus at least on the periphery of the early development of much of New Zealand's scientific research.

In addition to Hercus's membership of medical societies, he belonged to several scientific organisations where he mixed with scientists from different disciplines, as well as giving public addresses on preventive medicine. His public addresses were often reported in daily newspapers, a resource now readily available to historians through the Papers Past website.

One of Hercus's greatest strengths was in fostering research through providing the funding and facilities for carrying out this work. In my following of this procedure through official government publications I found that it opened up much wider debates and decision-making in the development of New Zealand's research culture, from the failed attempts to establish a medical research institute, to the beginnings of the DSIR, and eventually the establishment of the MRC. Hercus was there for all these discussions.

Hercus was able to flourish in a small country with few competitors, his progress bolstered by his outstanding war record and his role as Dean of the country's only medical school. He mentored many students in the course of his career with an impact sufficient for some to take up a career in medical research. Hercus's skills lay in strategic management, rather than as a laboratory-focused scientist but he never lost interest in following his researchers' experimental work and frequently co-wrote papers with them.

He was able to have an influence much further afield than the Otago region and his focus was on improving the nation's health. His work and that of the researchers he encouraged have resulted in a healthier nation and a greater understanding of several debilitating illnesses. Hercus set up what was in effect a medical research institute within the School, leaving this as a legacy upon his retirement.

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